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## OBSERVATIONS ON ARTERIAL HYPERTENSION\*

RALPH H. MAJOR, M.D.  
Kansas City

MANY physicians like to quote words of wisdom from master minds in the art of healing. Some quote the ancients, some quote their own masters, some quote their contemporaries and many have even been known to quote themselves. I have many times quoted a master clinician, Sir William Gull, who never wrote a paper or made an address which did not bristle with aphorisms and epigrams. Gull in discussing the attitude of physicians towards medicine once remarked, "We have no system to satisfy, no dogmatic opinions to enforce. We have no ignorance to cloak, for we confess it."

In presenting this discussion of arterial hypertension, I do so quite in this spirit of Gull and wish to stress that I have no ignorance to cloak for I freely confess it. We do not know what the cause of arterial hypertension is and we do not know how to cure it. But this by no means carries the implication that we may not be on the very threshold of the discovery of both. The past decade has witnessed Abrams' "electrotonic reactions" and Wilshire's "magic horse-collar," but it has also witnessed the unravelling of some of the most difficult problems of human pathology and the successful employment of this knowledge in the treatment of disease.

Sir William Gull is also the originator of another epigram which is germane to this discussion. He once remarked that "fools and savages explain, wise men investigate." While I shall from time to time, perhaps unconsciously, gravitate into the ranks of the explainers, I shall try hard to keep in the company of the wise men who investigate.

It is very difficult to pursue the study of any disease without acquiring an exaggerated opinion

of its importance. Phillipe Ricord, the great authority on syphilis, according to Oliver Wendell Holmes, "would have submitted Diana to treatment with his mineral specifics, and ordered a course of blue pills for the vestal virgins." We all know syphilographers with a similar mental twist.

However, it is no exaggeration to state that arterial hypertension is one of the outstanding medical problems calling for solution. We hear a great deal about the importance of diabetes and it is most certainly important, yet the average practicing physician sees ten cases of arterial hypertension to one of diabetes. How many cases of high blood pressure there are in this country we do not know. Most ideas on this subject belong rather to the realm of speculation than to the field of cold statistics. Fahr has estimated that in 1924 approximately one hundred and forty thousand people died in the United States from the immediate accidents or more remote effects of arterial hypertension—enough deaths to depopulate a fair sized city.

The question is often asked whether arterial hypertension is on the increase. This question should, I think, be answered in the affirmative. There has been much discussion as to whether our oft-quoted statistics about the lengthening of the life span may not be more apparent than real. Certainly the average length of life is much longer now than in previous centuries, due largely to the lowered mortality from infectious diseases in childhood and in young adult life. But it is a question whether a man of forty-five or fifty has a better chance of living longer than he ever had. However, there can be no question that there are more people of forty and fifty than there used to be. It has been said by some-

\*Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 25, 1932.

one, probably a man still in his thirties, that we are fast becoming a nation of old men, and although ones' definition of an old man shifts with each decade one passes, there are unquestionably more people now in the decades in which arterial hypertension occurs, and as a result more arterial hypertension.

When we consider the prevalence of arterial hypertension we are struck with the fact that it is very common among all the so-called civilized nations. While we are fond of attributing its prevalence in this country to our strenuous mode of life, yet it is very common in Europe where life still proceeds at a more leisurely tempo. And while the ruddy, full blooded, beef-eating Britisher and the ample proportioned beer-drinking German often develop high blood pressure, the more gracile and volatile Frenchman and Italian also have their troubles with this disease.

There is one striking exception to this universality of high blood pressure—the Chinese, who, at least in China, do not suffer from high blood pressure. This fact seems well established from the statistics of life insurance companies doing business in China and from data compiled in the Chinese medical schools and hospitals. It is also noteworthy that the disease we call chronic glomerular nephritis is comparatively rare in China.

There has been, of course, much discussion about this immunity of the Chinese to high blood pressure. The temperament of the people and the Oriental philosophy of fatalism have been invoked as sufficient explanations. Some think the calm mode of life is the determining factor, although press reports from China, as well as the accounts of missionaries who have departed upon extremely short notice, do not lead us to believe that calmness and quietude are outstanding factors in the life of contemporary China. Some authors have believed that the relative immunity of the Chinese is due to their dietary habits. Frost has expressed the belief that the absence of meat in the dietary is the determining factor and has pointed out that, on the basis of the examination of candidates for life insurance, Australia, which has the highest per capita consumption of meat, shows the highest average blood pressure. One of the most logical explanations which has been advanced is that the Chinese have no hypertensions because they do not inherit the tendency to develop this condition. This view receives some support from the fact that the chil-

dren of mixed marriages in China do not show this immunity as do those of pure Chinese blood—the hypertensive trait coming in with the European or American blood. But even if this view be correct the great question still remains unanswered, why their ancestors did not have hypertension. So this Chinese mystery remains unsolved. Some day it may be quite evident but today we "see through a glass, darkly."

One feature of the etiology of arterial hypertension about which there is no dispute is the important factor of heredity. No disease, with the possible exception of hemophilia and of certain familial nervous diseases, shows the same exquisite hereditary tendency as does arterial hypertension. Our chromosomes determine whether we are to have blue eyes or brown hair or, later, to have no hair worth mentioning. Beside hypertension the family tendency to tuberculosis, to cancer, to diabetes, pales into insignificance. We can predict with a great degree of certainty what the blood pressure of children born of two hypertensive parents will be in the course of time.

Unfortunately we can not tell our patients with hypertension that they should have picked different ancestors, any more than we can tell our psychoneurotic patients that it is unfortunate that their mothers were nervous. While we must admit, according to Oliver Wendell Holmes, that we are all *but* omnibuses in which our ancestors are taking a ride, we need not make the admission a corner stone of a fatalistic creed. Diabetes and hemophilia are both hereditary diseases, yet we have made much progress in our knowledge of their etiology as well as of their therapy. Pernicious anemia may also belong to this group but here a fatalist point of view has given away completely to a feeling of optimism.

We find in reviewing the subject of hypertension that some authors describe in great detail many kinds of hypertension and catalogue an imposing array of causes of hypertension. Undoubtedly we see various transient types of hypertension due to mental trauma, and to hyperthyroidism, and that one striking but rare variety, paroxysmal hypertension produced by adrenal tumors. However, the disease which we call essential hypertension, or hyperpiesia, or hypertensive' cardio-vascular disease, seems to be a definite clinical entity, following a definite clinical course and terminating in an equally definite



manner. This disease, it seems to me, is as definite a syndrome as Adams-Stokes disease or as coronary occlusion. It should be described as such in our medical treatises and not scattered around piece-meal, as is often the case, in the various sections on arteriosclerosis, chronic nephritis or what not.

In 1757, Theodore Tronchin of Geneva wrote an interesting book called "*de colica pictonum*." This book was a treatise on the colic of Poitiers, also called the dry belly-ache, or the Devonshire colic, a disease which Sir George Baker later proved was lead colic. Tronchin in his book describes an epidemic, in Amsterdam, of the colic which he says was due to the drinking of water which had run over leaden roofs and gutters. He discusses the effects of decaying leaves upon the lead gutters and the formation of lead salts soluble in water and seems quite clear and scientific but he spoils the book by describing seven additional causes of the colic of Poitiers. Some of the present day articles on hypertension may impress future readers very much as Tronchin's book impresses us today.

As we review the history of arterial hypertension we find that at first, under the influence of the brilliant studies of Bright, of Wilks, of Gull and Sutton all cases of high blood pressure were regarded as cases of chronic nephritis. Then, later, after the development of methods for studying blood chemistry and for estimating renal efficiency, it was found that many cases of high blood pressure showed no evidence of renal insufficiency and so these cases were placed in a separate category and called essential hypertension. Allbutt, as we know, who devoted years of thought and investigation to this problem, separated them sharply and called the disease hyperpiesia. More recently Keith, Wagener, and Kernohan have described a third variety, malignant hypertension, which runs its course more rapidly than the usual variety of hyperpiesia, and probably in less skillful hands is often diagnosed as glomerular nephritis.

We may ask ourselves frankly whether all three conditions may not really be differing manifestations of the same disease. We have an analogy in the course our conceptions of thyroid disease have taken in the past few years. Not so many years ago a very complicated system of classification of thyroid disease was popular. The essayist reading a paper on thyroid disease

found the multiplicity of his classification limited only by the time allotted for the reading of his paper. Some pathologists described a different picture of thyroid pathology every time they looked at a new section of thyroid tissue. Hertzler has, I think, rendered a great service to the subject of thyroid pathology in considering all these various pictures as simply chapters in the life history of the thyroid gland. The story may unfold itself in different ways in different parts of the thyroid gland but it is, after all, the same story.

It would seem to me highly probable that what we call essential hypertension with its cerebral cardiac and renal terminations may be the same basic disease that we call chronic glomerular or chronic diffuse nephritis. The tempo or duration of the two diseases differ but essential hypertension after all may be, to employ the language of the screen, a slow motion picture of chronic nephritis. My own colleagues, the pathologists, confess that they can not differentiate the kidneys of a so-called essential hypertension with marked renal lesion from the kidneys of a patient diagnosed as chronic glomerular nephritis. Further, I am not sure that the ophthalmologists are any more successful in their studies of the retinal changes.

This point of view is strengthened by the investigations upon the frequency of arteriosclerosis in arterial hypertension. The frequency of these lesions in the various organs apparently varies in different reports, but it is interesting that Fishberg in seventy-two cases of essential hypertension found arteriosclerosis present in the kidneys in one hundred per cent and Bell and Clawson in their admirable study of four hundred cases of primary hypertension found a renal arteriosclerosis in eighty-eight per cent of the cases.

The conceptions of the pathogenesis of arterial hypertension have revolved for the greater part of a century about two opposing views, the view of Gull and Sutton, that the cause of arterial hypertension is to be sought in a capillary fibrosis, and the view of Johnson that the capillary and arteriolar changes were not the cause of the hypertension but the result of the hypertension. This latter view, which many consider as a modern view, was very clearly stated sixty-four years ago. Sir George Johnson in 1868 expressed the belief that the cause of arterial hypertension was

the continued contraction of the arterioles. Johnson later saw in the observations of Gowers a confirmation of his views. Gowers described five cases of Bright's disease in 1876 in which by studying the eye grounds with an ophthalmoscope, he saw a direct relation between the degree of constriction of the retinal vessels and the degree of arterial tension at the wrist.

Since the days of Gull and Sutton and of Johnson an enormous literature has accumulated upon this subject. There has been much speculation particularly as to whether the changes in the renal vessels are the cause or the result of hypertension. We clinicians have long been accustomed by our training at the necropsy table to give the pathologist the last word. Bell and Clawson in concluding their study of primary hypertension state that "on the whole, the evidence seems to favor the hypothesis that hypertension causes renal arteriosclerosis." With this statement I am in full accord. These two and other observers have also pointed out that while there seems to be a close relationship between arteriosclerosis and hypertension, sclerosis of the aorta and peripheral arteries show no definite relation to hypertension. This should be emphasized, for we still see physicians puzzled because a patient has pipestem radials and a normal blood pressure. While arteriosclerosis and hypertension are twin brothers, arteriosclerosis is not even a member of the same family.

The pathological physiology of arterial hypertension is no less interesting than the pathological anatomy. According to Tigerstedt the normal blood pressure is the result of three factors, the force of the heart beat, the quality and quantity of the blood and the degree of peripheral constriction. An elevation in blood pressure may then be the result of an increase in any one of these three factors.

Hypertension as the result of an increase in the force of the heart beat alone is rarely seen clinically. The same may be said for hypertension due to changes in the quality and quantity of the blood. Theoretically an increase in the viscosity of the blood is invariably raised but Vaquez, who first described this disease, has recently stated that most of these patients show no elevation in blood pressure. We are left then only the third alternative, that clinically an elevation in blood pressure is associated with an increase in peripheral resistance. And indeed the

evidence is constantly accumulating that this is the important and determining factor.

The studies on the capillaries and arterioles of the skin and of mucous membranes have aided greatly in the elucidation of this problem. The names of Kylin, Otfried Müller, Lange and George Brown are associated especially with research in this field. While there are certain disagreements in interpretation, and even more marked discrepancies in the description of the appearance of the arterioles and capillaries, there seems general agreement that there is a state of increased tonus of the arterioles in arterial hypertension, and especially is there a widespread constriction of the smaller arterioles.

What is the cause of this constriction? Sir George Johnson, as far back as 1868, expressed his conviction that arterial hypertension was the result of a continued contraction of the arterioles, and observed that "the minute arteries in any part of the body may be excited to contract, by their contents becoming abnormal and therefore more or less noxious to the tissues." Some years later Sir William Broadbent, in 1890, stated his adherence to the views of Johnson, and said that the cause "can scarcely be other than some substance present in the blood which acts directly upon the capillary walls." He adds that "the special material which plays this part is almost certainly nitrogenized waste which has not undergone the complete oxidation necessary for elimination."

Both of these statements were made before we had the modern methods of blood analysis which grace our present day biochemistry. They were perhaps only shrewd guesses, yet we must admit that we are still indulging in guesses regarding this abnormal and noxious substance in the blood.

There has been a great deal of search for substances in the body having a pressor effect but the only one that has been positively identified and isolated is adrenalin. Some observers, notably von Neusser and Vaquez, have suggested that hypertension may be the result of an excess secretion of adrenalin. Some of their enthusiastic disciples have even gone so far as to propose that we call hypertension hyperadrenalinemia. Unfortunately no one has ever demonstrated an excess of adrenalin in the blood of patients with arterial hypertension. There is, however, one rare type of hypertension, the so-called paroxysmal hypertension, which is unquestionably due to

an adrenal tumor. Pincoffs has described such a case in which an extract of the adrenal tumor contained large amounts of a pressor substance, and it seems only reasonable to conclude that the paroxysmal attacks of hypertension are due to a sudden release of this pressor substance, probably adrenalin, into the blood-stream. These cases, however, differ particularly because of the paroxysmal appearance of their attacks, from the syndrome we are discussing.

Increased amounts of uric acid, of sugar, and of cholesterol have been observed in the blood of hypertensive patients. These findings are interesting but we do not know what they mean. None of these substances have a hypertensive effect and it is noteworthy that the highest blood sugars we see are in diabetes, the highest blood cholesterol is in lipoid nephritis and diabetes and the highest blood uric acid in leukemia and gout—all diseases which have no close relationship to arterial hypertension.

For several years we have been interested in the possibility that an increased amount of certain guanidine bases in the body, may play a rôle in arterial hypertension. We have described a method for the quantitative estimation of guanidine in the blood and applied this method to the study of the blood of hypertensives. Up to the present time we have studied more than five hundred cases of hypertension. Approximately sixty per cent of the cases of "essential" hypertension have shown an increase of "guanidine" in the blood while one hundred per cent of the cases of chronic nephritis have shown this increase.

The statement has been frequently made in the literature that our results have not been confirmed. So far as I know only two observers have repeated this work. Davis found blood guanidine much higher than normal in a series of hypertensive patients and Pfiffner and Myers state they have confirmed our findings.

In all of our communications we have emphasized the fact that we do not know positively what this substance is which is increased in the blood of hypertensives, and that we employ the term "guanidine" in quotation marks. We can not be positive that it is a guanidine base until it is definitely isolated and this, at present, is a chemical problem which has not been solved. However, the substance responsible for the reaction behaves very much like guanidine. There is also good

evidence that in chronic nephritis guanidine bases are increased in the blood.

The weakness of this theory lies in the fact that the known guanidine compounds that have been isolated in the body—arginine, creatine and creatinine—have no effect on the blood pressure. Recently, however, Komarow has described methyl guanidine, a powerful pressor compound, in muscle tissue. We have not been able to prove the identity of this substance which is increased in the blood of hypertensives but we feel sure it is neither arginine, creatine or creatinine.

While the possibility that hypertension is due to an excess amount of a pressor substance has been extensively discussed, the opposite hypothesis has received little attention. It is theoretically just as plausible that hypertension may be due to the lack of a depressor substance as that it is due to an excess of a pressor substance. Indeed it is striking that while it has been extremely difficult to demonstrate more than one pressor substance, several depressor substances have been isolated and there is good evidence that there are others as yet not isolated and unidentified. We have discussed on other occasions this possibility that hypertension may be due to a lack of depressor substance—a type of deficiency disease—and during the past few months Wollheim and Lange, working in von Bergman's clinic in Berlin, have reported a very interesting observation. They state that there is, in the normal urine, an unidentified substance which has a depressor effect and that the urine of hypertensives shows little or none of this substance. This observation, if confirmed, is a very important one.

In summarizing the present knowledge regarding the immediate cause of hypertension we have suggestive evidence that there is an increased amount of a guanidine compound in the blood of a majority of cases of hypertension and in practically all cases of chronic glomerular nephritis. It can not be asserted, however, that this substance is the cause of hypertension since it may be only some retention product which accumulates because of renal insufficiency. Whatever its significance it is worthy of further study.

If our knowledge of the etiology of arterial hypertension is shrouded in a certain haze, our knowledge of an effective therapy in this disease is enveloped by a dense fog. However, we can relieve most patients of their most disagreeable symptoms, prolong the lives of many and

in some instances apparently aid the patient to a spontaneous recovery.

The general principles of treatment are well known to you. When the patient is overweight he should be reduced. This procedure alone in some instances reduces the pressure. The fluid intake should be reduced since there is excellent evidence that there is a relationship between intake and blood pressure. The patient's heart should be under careful scrutiny and at the first sign of lagging, digitalis should be administered.

There is a great deal of discussion in regard to the advisability of lowering the blood pressure in arterial hypertension. The physician often remarks to the patient, "Well, you have been going at high pressure so long I do not think it wise to lower your pressure." This is a favorite remark. I have used it, especially with those patients whose pressure I knew I could not lower.

This view is often a refuge rather than a conviction. However, there are two conditions associated with arterial hypertension in which a marked lowering of blood pressure is certainly inadvisable. The first of these is a marked cardiac hypertrophy. When we lower the blood pressure markedly, we diminish the flow in the coronary arteries. Anyone can prove this to his satisfaction in the physiological laboratory. If a patient has a large heart which is laboring under the strain of a hypertension, it obviously needs an increased coronary circulation and any reduction in this circulation may be disastrous. Nor is this idle speculation. We have seen patients with large hearts, following a marked fall in blood pressure, show definite anginal symptoms.

The second contra-indication to a marked lowering of blood pressure is cerebral arteriosclerosis or arteriolosclerosis. Many patients with arterial hypertension, as Bordley and Baker have shown, have sclerosis of the cerebral vessels. In such patients a marked fall in blood pressure may interfere with the cerebral circulation and cause alarming symptoms such as marked dizziness, staggering, mental lassitude and torpor or even unconsciousness.

I do not believe we often see these complications because, to quote Mackenzie, "The efforts employed to reduce the blood-pressure are usually of little effect."

While it may not be desirable to reduce the blood pressure to normal levels, in many instances a certain reduction may be desirable. I do not

agree with the school who would have us believe that high blood pressure is compensatory, or protective and should be left alone. A certain elevation in blood pressure like an elevation in temperature may be a protective phenomenon. Yet I doubt whether a pressure of 240 is protective any more than a temperature of 106° F. The difference between a pressure of 200 and 180 may be the difference between severe headaches and no symptoms, and yet if we try to prove that we had accomplished this therapeutic result, the skeptic would regard our blood pressure record with an easy tolerance and explain the disappearance of the headaches with that magic adjective—psychic.

Bodily, nervous and mental rest unquestionably lower the blood pressure. Many sedatives, notably those of the barbituric family, are of great aid.

The most promising field of therapy, it seems to me, lies in a study of the depressor substances in the body. Perhaps I am unduly optimistic like Micawber, but I hope I am not just waiting around for something to turn up.

The existence of a number of depressor substances in the body has been demonstrated during the last few years. Those which have been identified are histamine, choline, aceto-choline, adenylic acid and adenosine. Therapeutically these substances have as yet proved disappointing. However, there are others left. We have been working for some time in the attempt to isolate and identify a depressor substance which is present in several tissues in the body, notably the brain. Such substances probably play a definite physiological rôle in health and an understanding of this rôle may unravel for us many problems relating to the etiology and treatment of high blood pressure.

It would be interesting to speculate on these unidentified depressor substances or on the rôle of histamine, choline, aceto-choline, adenylic acid and adenosine. But I do not wish to be classed with fools and savages who explain, but rather with Gull's wise men who investigate.

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## DISCUSSION

DR. GEORGE E. BROWN (Rochester, Minn.): Dr. Major's work is probably the first intelligent, prolonged

investigation of one of the most important phases of hypertension. As you know, he has been at this work a number of years. As a result of his report this afternoon one gathers a very distinct sense of encouragement that this intensely interesting disease which we call hypertension may have a chemical basis.

As far as we know anything of hypertension (I am speaking of so-called essential hypertension) the familial factor seems clear. Sometimes there are striking exceptions. In between 50 and 75 per cent of the cases we see, this familial tendency can be definitely established. The question is, what is the basis of this familial or inheritable trend? How are vasomotor patterns transmitted? When we turn to the men who are investigating problems of inheritance, they state that this potentiality rests in the chromosomes. May not the factor that is transmitted through the chromosomes be some fault in chemical metabolism, perhaps an increase or a decrease, or lack of some potent substance that has to do with keeping our blood pressure within the so-called normal range? There is no normal blood pressure. If we took the blood pressure of everyone in this room, from minute to minute, we would find it to be fluctuating. We could divide the subjects into three groups: one group in which the fluctuations of blood pressure from minute to minute would not exceed 5 or 10 mm. of mercury; another group in which the fluctuations would be twice or three times this, and a third group in which fluctuations would be from 40 to 60 mm. of mercury. The last group would be composed of persons with true hypertension.

These conclusions are based on some interesting work that we have been carrying out. Dr. Hines and I have developed a standard stimulus by which to study vasomotor fluctuations. If you put your hand in ice water, at a temperature of 4° to 5° C., hold it there a minute or two, and watch the blood pressure, you will note a definite rise of pressure, which, however, within a minute will return to the level that existed before examination. Among 100 persons between the ages of twenty and thirty-five years, approximately 5 to 10 per cent will have abnormal rise resulting from local application of cold. Still, these subjects do not have hypertension, at least not clinically. The question arises, are these people going to have hypertension? Interestingly enough, practically all have the "hypertension strain" in their families.

This all goes back to the problem Dr. Major discussed this afternoon, namely the possible chemical basis for hypertension. If guanidine or depressor substances are of etiologic significance, they ought to be obtained from the bodily tissues or fluids of subjects who are going to have hypertension. I should think that that would be the next step in this investigation.



## EXPERIMENTAL EVIDENCE FOR INTRAVENOUS VACCINE THERAPY IN CHRONIC ARTHRITIS\*

B. J. CLAWSON, M.D.  
Minneapolis

THE conclusions drawn from the experiments reported in this paper, insofar as chronic arthritis is concerned, are based upon the assumption that chronic arthritis is, for the most part, an infectious disease due to streptococci. This assumption is strongly supported by bacteriological, immunological, and pathological findings.

The experiments have to do with the development of a method of administering a streptococcic vaccine which will not produce hypersensitiveness (allergy) but will desensitize patients already hypersensitive and will produce a high degree of protective immunity. The subcutaneous and intravenous methods of giving a vaccine were studied relative to hypersensitiveness, desensitization, and protection.

*Hypersensitiveness (allergy).*—In a previous report it was found that the degree of tissue response in animals could be used as an indicator of hypersensitiveness. The tissue response was compared in normal animals with that in animals injected subcutaneously and intravenously with live streptococci. The degree of hypersensitiveness was 2.2 per cent in the normal animals, 88 per cent in the animals injected subcutaneously, and 1.1 per cent in animals injected intravenously. The average agglutination titer was 1:3200 in the animals injected subcutaneously and 1:200,000 in the animals injected intravenously.

These experiments showed that subcutaneous injections caused the development of a hypersensitiveness and that intravenous injections did not. The subcutaneous method did not desensitize the hypersensitive animals, for hypersensitiveness is produced and maintained by subcutaneous injections.

*Desensitization.*—Ten animals were made hypersensitive and later vaccinated intravenously with *Streptococcus viridans*. The vaccinated hypersensitive animals gave a tissue response of 5.2 per cent as compared with 88 per cent in the

nonvaccinated hypersensitive animals. The average agglutination titer in the nonvaccinated hypersensitive animals was 1:3200 and in the vaccinated hypersensitive animals 1:50,000. The hypersensitive animals were desensitized by the intravenous method of vaccination. As far as hypersensitiveness is concerned, the intravenous method of vaccination rather than the subcutaneous method should be used.

*Protective immunity.*—It was found in the preceding experiments that the streptococcic agglutination titers were higher in animals injected intravenously than in animals injected subcutaneously. To test the protective merits of the subcutaneous and the intravenous methods of injecting a streptococcic vaccine, two groups of animals were selected. Group 1 was vaccinated subcutaneously at five weekly intervals with one billion killed streptococci. Group 2 was vaccinated intravenously at the same periods with the same doses. The animals vaccinated subcutaneously had agglutination titers ranging from 1:1600 to 1:6400. The animals vaccinated intravenously had titers of from 1:200,000 to 1:400,000.

The evidence of a correlation between the height of an agglutination titer and protection was shown by comparing the rate at which streptococci were killed in normal animals and in animals which had a high agglutination titer. Normal rabbits and rabbits highly immune to streptococci were injected intravenously with 50 million live streptococci. In fifteen minutes 1 c.c. of blood was taken from the heart of each animal and plated on agar. It was found that the rate of disappearance of the streptococci from the blood in fifteen minutes was three times greater in the immune than in the normal animals. The streptococcic agglutination titers averaged 1:45 in the normal animals and 1:170,000 in the immune animals.

Since the agglutination titer rises decidedly higher by the intravenous method of vaccination than by the subcutaneous method and since the above experiments showed a correlation between an elevated agglutination titer and desensitization

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and immunity, the intravenous method of administering a vaccine would seem to be the one of choice.

*Type or species specificity in desensitization and protective immunity.*—If desensitization and immunity should be type (strain) specific, then it would seem that autogenous vaccines should probably be used in most cases. If, on the other hand, these two phenomena should be only species (group) specific, then a stock vaccine would in most cases likely be sufficient. The following experiments show the relation of acquired desensitization and immunity to strain and group specificity.

Animals made hypersensitive to *Streptococcus viridans* of acute rheumatic origin were vaccinated intravenously with *Streptococcus hemolyticus* from a case of puerperal sepsis. The degree of hypersensitiveness to *Streptococcus viridans* was then determined and found to be 0.4 per cent as compared with 88 per cent in nonvaccinated hypersensitive animals. The desensitization did not seem to be type (strain) specific.

In a series of animals each animal was immunized with a different strain of streptococcus of chronic arthritic origin and later each of the animals was injected with 50 million organisms of another strain of streptococcus. The rapidity with which this organism disappeared from the blood (tested in fifteen minutes) was much greater than in normal animals. These experiments suggested that protective immunity was also not strain specific.

*Nonspecific protein therapy (B. typhosus) in streptococcic infections.*—Animals were made hypersensitive to *Streptococcus viridans* and later vaccinated intravenously with *Bacillus typhosus*. The degree of hypersensitiveness to *Streptococcus viridans* remained practically the same as in

the nonvaccinated hypersensitive animals. It was concluded that desensitization to streptococci was not brought about by a nonspecific protein reaction.

Animals vaccinated intravenously with *Bacillus typhosus* developed a high agglutination titer to *Bacillus typhosus*. The titer to *Streptococcus viridans* was raised but slightly. When these animals were injected intravenously with 50 million streptococci, it was found that the rate at which streptococci disappeared from the blood was even less than in normal animals. Protection against streptococci was not brought about by intravenous vaccination with *Bacillus typhosus*.

The above experiments supply the following conclusions as a basis for intravenous streptococcic vaccination in chronic arthritis:

1. Subcutaneous injections of a streptococcic vaccine do not desensitize the hypersensitive individual but tend to increase the hypersensitive state.

2. The subcutaneous method develops only a slight degree of protection.

3. The intravenous method of giving a streptococcic vaccine desensitizes the hypersensitive patient, does not develop hypersensitiveness, and does cause a high degree of protective immunity to be developed.

4. Neither the desensitizing nor the protective phenomena are strain specific but they appear to be group specific. They are not of the nature of a nonspecific protein reaction.

5. From the standpoint of both desensitization and resistance the intravenous method rather than the subcutaneous method of giving a streptococcic vaccine in chronic arthritis is indicated. Intravenous injection of *Bacillus typhosus* in treating chronic arthritis would seem to be contraindicated.

## THE TREATMENT OF CHRONIC ARTHRITIS\*

THE ROLE OF INTRAVENOUS STREPTOCOCCIC VACCINE

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THE problem of treatment in chronic arthritis has been a difficult one in the past because of the uncertainty as to the specific agent causing the disease. The bacteriological, pathological, and clinical evidence accumulated in the past few years points strongly towards streptococcic infection in a majority of cases. The literature on this subject has been recently reviewed by us.<sup>1</sup> From the evidence at hand it is our impression that about 90 per cent of the cases of true arthritis are due to such streptococcic infection. Other cases of chronic arthritis are due to gonococci, bacillus tuberculosis, occasionally spirochetal involvement, and possibly in some cases staphylococci, though there is very little definite evidence of the latter as an etiological agent. In considering the history, findings, and roentgen studies, gonorrheal, tuberculous and syphilitic arthritis can usually though not always be distinguished from streptococcic arthritis. There are also certain non-infectious joint conditions that must be differentiated from arthritis, namely, traumatic joints, senescent changes, and gout. Unfortunately the term arthritis has been used loosely in the past to cover some such conditions that are obviously not due to infection. There also is some controversy at the present time as to which cases are and are not of infectious origin. We have been unable to place our patients into such distinct classes as (1) rheumatic fever; (2) rheumatoid arthritis (atrophic infections, proliferative); and (3) osteo-arthritis (hypertrophic, degenerative). It is our opinion that there is in general a gradual gradation in the clinical types of streptococcic arthritis from childhood to old age. This opinion is based on bacteriological, pathological, and immunological studies as well as roentgen and clinical observations and is to be reviewed fully elsewhere.

The treatment of arthritis falls into two classes: (1) specific, directed at the causative agent; and (2) secondary, directed at the contributing factors and the patient's general well

being. The chief consideration here will be specific treatment in the form of intravenous streptococcic vaccine therapy for those patients with arthritis of presumable streptococcic origin. The intravenous method was used because of the basis established by Clawson.<sup>2, 3, 4</sup> In the treated group have been included all cases in which there was no other clear cut cause such as gonorrhea, tuberculosis, or syphilis. Older individuals without joint pains and with senescent new bone production largely found by roentgen ray were not considered as arthritis of any type and of course were not treated. No further selection of cases was made other than that the joint pain had been persistent for at least two months. The patients were from the out-patient department of the University of Minnesota Hospital. They were largely ambulatory although a number were using canes or crutches or brought in by wheel chairs. A few of the patients with severe involvement were placed in the hospital. Eighty-eight per cent of the patients had had arthritis for more than one year.

*Method.*—At the present time six hundred patients have received intravenous streptococcic vaccine therapy. Undoubtedly a few patients with gonorrheal or tuberculous arthritis and occasionally other types may be confused with streptococcic arthritis and in case of doubt such patients have been treated.

The strain used was isolated from an individual with clinical rheumatic fever and pericarditis and has been used experimentally for the past nine years. This strain is of low virulence, not a self agglutinator, and cross agglutinates in high titer with many other strains of streptococci from patients with clinical rheumatic fever and chronic arthritis.

The initial dose was 100 million and this was usually increased by 100 million at each weekly injection until at least eight injections were given. The increase in dosage and maximum dose given were dependent on the reactions and clinical improvement. The maximum dose did

\*Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 25, 1932.

not usually exceed 800 million killed organisms. In some of the earlier cases treated a maximum dose of five billion had been given but now discontinued because of no greater improvement and more severe reactions than with the smaller doses. It is of interest that untreated arthritic patients with high initial agglutinating titers responded no better to therapy than those with lower titers.

TABLE I. RESULTS OF THERAPY  
(301 cases)

	Number of cases	Per cent
Definite clinical improvement.....	233	74.4
Questionable improvement.....	19	6.3
No improvement.....	49	16.3

TABLE II. CRITERIA FOR IMPROVEMENT

	Number of cases	Per cent
1. Joint pain (282 cases)		
Decreased pain.....	233	82.6
Unchanged.....	49	17.4
2. Joint swelling (197 cases)		
Decreased swelling.....	160	81.2
Unchanged.....	37	18.8
3. Joint motion		
Increased motion.....	206	84.7
Unchanged.....	37	15.3

TABLE III. TIME OF BEGINNING DEFINITE IMPROVEMENT

	1	2	3	4	5	6	7	8	9	10	Over
Number of treatments.....	13	39	46	47	34	18	13	8	11	2	2
Number improved.....	5.6	16.7	19.7	20.2	14.5	7.7	5.7	3.4	4.7	1.3	1.3
Percentage improved.....	5.6	22.3	42.0	62.2	76.7	85.5	90.2	93.6	97.4	98.7	100

TABLE IV. INITIAL AGGLUTINATION TITER IN CHRONIC ARTHRITIS  
(300 cases)

	1:0	1:50	1:100	1:200	1:400	1:800	1:1600	1:3200	1:6400
Dilution.....	30	33	67	73	64	25	6	1	1
Number.....	10	11	22	24	21	8.3	2	0.3	0.3
Per cent.....									

**Reactions.**—Reactions of some sort were experienced following about fifty per cent of the injections. These usually consisted of moderate fever and chills coming on two to ten hours after the injection. There was no correlation between improvement and reactions experienced.

**Results.**—In the consideration of results it is important that these individuals were outpatients receiving no medication and living their usual life at home. Clinical improvement was based on three criteria: (1) decrease in pain; (2) decrease in joint swelling; (3) increase in joint motion (Table I).

Excluding the nineteen questionable cases the results for the different criteria for improvement are tabulated as in Table II.

The improvement has been manifested as fre-

quently in those with predominating hypertrophic bone changes as in other clinical variations. The individuals with very extensive involvement have been the most difficult to improve. A significant factor in considering this high percentage of improvement is that these patients received no other therapy, not even rest, and were at home living their usual lives.

**Number of Injections Necessary for Clinical Improvement.**—Nearly two-thirds of the patients experiencing improvement did so after five injections; nine-tenths did so after seven injections (Table III).

**Agglutination Titers and Vaccine Therapy.**—The greatest percentage of untreated arthritic patients showed an agglutinating titer of 1:200 with the strain of streptococcus used in the vaccine, which was about the same as for a group of "normal" persons whose serums were used with this safe strain (Table IV). The intravenous vaccine therapy stimulated a rise in the agglutinating titers in the serums of most patients. Clinical improvement occurred most frequently when the titer was 1:6400 or more (Table V).

The height of the agglutinating titer seemed to be a reliable indicator in most instances of the protection possessed by the patient against streptococci. Patients with clinical improvement usually showed a correlated high agglutinating titer. Improvement was maintained as long as the titer remained definitely elevated. Symptoms returned when the titer again became low and subsided following further treatment and re-elevation of the titer. As a further check on the significance of the agglutinating titer, the bactericidal power of the blood for streptococci was determined by using the method of Sutliff and Rhoades,<sup>5</sup> who determined the bactericidal power of the blood for pneumococci in patients with lobar pneumonia. We tested the blood of normal individuals untreated and treated arthri-



tic patients. The blood from treated patients with an agglutination titer of 1:6400 or more was found to have a much higher bactericidal power against the streptococci used in the vaccine than did the blood of normal patients, untreated arthritic patients or treated patients with low agglutinating titers.

acute phases of arthritis with persistent fever the dosage has been reduced or treatment postponed until the acute febrile period has ended.

*Follow-up Study.*—At the present time we are conducting a follow-up study of over 100 patients who received the first treatment more than a year ago. This analysis is not yet completed

TABLE V. DISTRIBUTION OF MAXIMUM AGGLUTINATION TITER IN 188 IMPROVED TREATED ARTHRITIC PATIENTS

Titer .....	1:800	1:1600	1:3200	1:6400	1:12800	1:25000	1:50000	1:100000
Number .....	4	9	27	54	71	20	3	0
Percentage .....	2.1	4.7	14.3	28.8	37.8	10.6	1.7	
Total percentage .....	2.1	6.8	21.1	49.9	87.7	98.3	100	

TABLE VI. DURATION OF ELEVATED AGGLUTINATION TITER AND CLINICAL IMPROVEMENT FOLLOWING A COURSE OF THERAPY AND WITHOUT FURTHER INJECTIONS

Patient	Time since treatment	Titer after course of treatment	Titer after interval	Improvement sustained
1	10 mo.	100,000	6,400	Never improved
2	8 mo.	6,400	6,400	+
3	7½ mo.	6,400	3,200	+
4	7 mo.	25,000	25,000	+
5	7 mo.	12,800	6,400	+
6	6 mo.	1,600	3,200	+
7	6 mo.	25,000	6,400	+
8	6 mo.	6,400	6,400	+
9	6 mo.	12,800	6,400	+
10	5 mo.	25,000	25,000	+
11	4 mo.	6,400	12,800	+
12	3 mo.	1,600	12,800	+
13	3 mo.	—	3,200	+
14	3 mo.	12,800	3,200	—
15	2½ mo.	6,400	12,800	+
16	2 mo.	25,000	800	—
17	2 mo.	6,400	1,600	+
18	2 mo.	12,800	6,400	+
19	2 mo.	3,200	6,400	+
20	2 mo.	6,400	6,400	+

*Duration of Improvement and Elevation of the Agglutinating Titer.*—The titer will often remain elevated for many months in some patients and for shorter periods in others. Clinical improvement and elevated agglutinating titers have persisted in a number of patients for as long as two to eight months without treatment (Table V). If there be a recurrence of symptoms, one or two weekly injections will usually re-elevate the titer and again bring about clinical improvement.

*Contraindications to Intravenous Vaccine Therapy.*—We have not treated pregnant women because of the frequency with which abortion was produced in pregnant hypersensitive rabbits receiving intravenous injections of streptococci. We considered it inadvisable to administer similarly intravenous vaccine to patients with chronic arthritis who also had glomerulonephritis. In

but in general is very encouraging. There is much variation in the frequency of therapy required to maintain clinical improvement and with it an elevated agglutinating titer. Some individuals require therapy every few weeks over a long period of time while others may go at least eight months without symptoms. In most cases of well established arthritis there has been an alleviation of symptoms and an arrest in progress of the disease rather than a cure. In early cases many are apparently completely free from symptoms. Such patients of course often improve without therapy. While it is difficult to draw conclusions from the treatment of these early cases they undoubtedly are the individuals who urgently require treatment with the hope of preventing serious future damage. One important point to emphasize in regard to intra-



venous streptococcic vaccine therapy is that it is inexpensive and does not interfere with the patient's work and activities.

*Secondary Factors in the Treatment of Arthritis.*—In our series we have ignored other methods of treatment in order to evaluate the intravenous streptococcic vaccine therapy alone. We feel that that type of treatment has accomplished better results than the methods which we term secondary. Other authors, however, have been very enthusiastic in the support of some of those methods. In treating arthritis everything should be done that may be of therapeutic value and that is economically practical to use. Obviously it is impossible to use many of the methods advised for all cases, because of the expense and inconvenience incurred. The following secondary therapeutic methods are discussed briefly:

1. *Rest* is undoubtedly of value in the treatment of arthritis as in any other infection. During acute stages bed rest is often of value although it is usually inadvisable to completely immobilize any joint for a long period of time. The rest factor must be regulated to suit the individual case.

2. *Diet* is considered by some investigators as of primary importance in the treatment of chronic arthritis. Colonic roentgen studies have shown stasis and dilatation of the colon in a significant percentage of arthritic patients. Pemberton<sup>6</sup> is of the opinion that there is an intolerance to carbohydrate foods and a lowered sugar tolerance in such individuals. Fletcher<sup>7</sup> has pointed out the advisability of sufficient Vitamin B in the diets of chronic arthritic patients. A few have advocated colonic flushes in the treatment of arthritis though there seems some question as to the advisability of this procedure. Most authors are in accord in advising proper bowel management and the control of constipation, when present, by dietary measures, avoiding cathartics and using sufficient quantities of cooked fruits and cooked green vegetables to obtain normal stools. In obese individuals weight reduction by dietary means seems advisable if only to lessen the traumatic influence on the spine, sacro-iliac, and lower extremity articulations.

3. *Massage and physiotherapy* in some form are often resorted to in treating chronic arthritis. Such treatments are extensive in their variations and range from the use of a hot water bottle to an extensive stay in an institute for

bath and massage therapy. It is impossible to adequately discuss these methods here other than to state that they often bring some relief but not often a prolonged effect. The expense incurred by such methods is often unjustifiable. Certain home measures of using dry heat, the use of a simple light box and supervised massage and exercises are of practical value in many cases. The proper use of sunlight and ultra violet lamps are probably of some value in treating arthritis.

4. Exposure to wet is often a factor not only in inciting an arthritis but also in aggravating the condition once it is present, and occupations requiring such exposure should be avoided by arthritic patients. Climate undoubtedly plays an important rôle in the incidence of arthritis and climatic change may be of some value in therapy.

5. *Endocrine disorders* have been mentioned as playing a rôle in inciting and aggravating arthritis. Whether this be joint pain on some metabolic basis or true arthritis is not always clear. Both hyperthyroidism and hypothyroidism have been said to be inciting and aggravating factors in arthritis which will be benefited by proper treatment of the thyroid condition. The menopause has been said to be in some way associated with some cases of arthritis although the exact basis is not clear.

6. *Medications* of many types have been used in arthritis. Drugs of the salicylate group have probably been used most frequently to bring relief from pain. Cinchophen and neocinchophen have also been used frequently, though they have fallen into some disfavor because they have caused serious liver damage in a few instances. Iodine, arsenic, and sulphur have also been used somewhat, with variable relief of symptoms. Iron in the form of Bland's (60-80 grains per day) or Iron Ammonium Citrate (6-8 grams per day) is usually of much value in treating the anemia which frequently is present in arthritic patients.

7. *Vaccine therapy* (other than intravenous streptococci) has been used rather extensively in the past. Streptococci have been used most extensively in varying doses and with variable reports as to value. Clawson's experimental work on animals would make it appear that streptococci subcutaneously or intramuscularly would be of little value if not contra-indicated because of the danger of producing hypersensitiveness, although Crowe,<sup>8</sup> Small,<sup>9</sup> and Burbank<sup>10</sup> have re-

ported favorable results with small doses over a long period of time. Typhoid bacilli have been injected intravenously and intramuscularly in many cases. A few fatalities have been reported following the intravenous use. Some authors have reported beneficial results in many cases. About fifty patients in our series had previously received intravenous typhoid vaccine. Our experience here with typhoid intravenously has been unfavorable, as only an occasional patient had reported any improvement following therapy. Individuals vaccinated with typhoid have not shown a rise in the streptococcic agglutinating titer and Clawson has had similar experience with experimental animals. Other injections such as sterile milk have been used in treating arthritis and this too has been of very little effect in our experience although some authors have felt it to be of value. The benefit occasionally derived from foreign protein therapy is probably on a basis of the thermal reaction rather than any antibody effect.

8. *The removal of foci of infection* is frequently mentioned as of primary importance in the treatment of arthritis. Definite foci are not demonstrable in a majority of cases, but when present merit attention. Radical treatment of unlikely areas seems hardly indicated. In early arthritis the removal of probable foci has often seemed of great value although in the well established cases the elimination of such foci has seemed of very slight value. In some cases of arthritis there has been a marked exacerbation of symptoms following such removal. In our practice foci have not been eliminated before satisfactory intravenous streptococcic vaccine therapy had been given and the agglutinating titer raised to at least 1:6400.

9. *Orthopedic measures* are often of great value in the prevention and correction of deformities and coöperation with an orthopedist is of value in the management of many arthritic patients.

#### SUMMARY

Six hundred patients with chronic arthritis have been treated with intravenous streptococcic vaccine therapy and in the group analyzed about 80 per cent have shown definite clinical improvement in less than ten weeks as determined by a decrease in pain and joint swelling and by an

increase in the motility of joints. The height of the agglutinating titer corresponds fairly closely with clinical improvement. A titer of 1:6400 with this particular strain usually is necessary for clinical improvement, although 1:3200 is sufficient in some cases and even lower in a few others. Many patients who have shown a recurrence of joint pain after discontinuing therapy have shown a decrease in the agglutinating titer and have again noted improvement after sufficient therapy to again elevate the titer to 1:6400 or more. Many of the unimproved patients have been those in whom we have been unable to elevate the agglutinating titer to a level of 1:6400 or more, forty per cent of the unimproved group showing such low titers. Some unimproved patients have had agglutinating titers above 1:6400. The reason for lack of clinical improvement in such patients might be explained on several grounds such as: (1) the arthritis being of non-streptococcic etiology; (2) the arthritis being due to a streptococcus not biologically related to the injected strain; and (3) the infection being so extensive that the immunity produced was insufficient to produce a clinical effect.

We have limited our therapeutic measures in a large group of ambulatory patients to vaccine therapy alone in order to determine the value of this one method of treatment, but feel that in certain cases other methods should be employed, such as rest, physiotherapy, massage, diet, medication, and change of climate. The application of such measures depends largely on the degree of arthritis and the economic conditions in the case. In general all methods of therapy are most effective early in the disease before marked pathological changes have taken place. It has been our impression that specific therapy in the form of intravenous streptococcic vaccine has been of greater value in a higher percentage of cases than any of the secondary methods employed.

#### CONCLUSIONS

1. Eighty per cent of the patients receiving intravenous streptococcic vaccine have manifested clinical improvement.
2. This improvement has occurred in less than ten weeks in nearly all instances.
3. The agglutinating titer of the patients'

blood rose during the course of treatment. Improvement as a rule did not take place until the titer had risen to 1:6400 or more.

4. The height of the agglutinating titer in most cases seems to be a reliable indicator of the degree of the patients' protective immunity to streptococci.

5. Clinical improvement and a high agglutinating titer may be sustained without therapy for a variable period of from a few weeks to many months.

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## DISCUSSION OF PAPERS BY DR. CLAWSON AND DR. WETHERBY

DR. F. H. K. SCHAAF (Minneapolis): The recognition that sensitization is an extremely important factor not only in acute but in chronic infections as well has been recently emphasized. In acute conditions, particularly in the study of tularemia and undulant fever, we have found that sensitization undoubtedly is a very important factor in the production of clinical symptoms.

I think the recognition that sensitization and anaphylaxis may be very contributory factors in chronic arthritis is a great step in advance, because of the failure of the old metastatic infection theory that we were merely dealing with metastatic processes in the joints.

In the original work we first noticed that in horses, when they were being immunized to produce antitoxins, subcutaneous injections of live organisms for some weeks would produce both endocardial and joint changes. It was also found that these joint changes were not only produced by streptococci, but by pneumococci, and different other organisms. In other words, I don't believe we have any right to assume that the streptococcus is the only organism that will produce chronic arthritis.

I admit that intravenous vaccination, at least according to the evidence presented, seems to be a definite step in advance, but as to whether or not it is going to solve the problem can only be told after we have observed these cases for a period of two, three or more years, because our greatest problem has been not so much temporary clinical improvement but prevention of recurrence.

I must say that in many instances the use of foreign proteins, such as milk, blood, horse serum, or no matter what it is, has given me temporary results, sometimes very startling, particularly in the monarticular forms. But the greatest difficulty has been the recurrence after a year or two. Whether or not the intravenous vaccination will solve that problem, only time will tell.

DR. M. J. SHAPIRO (Minneapolis): The use of streptococcus vaccine intravenously in the treatment of chronic arthritis and other rheumatic infections is based on the following four premises:

1. That the streptococcus causes chronic arthritis as well as rheumatic fever.
2. That the agglutination reaction is a specific one and that it indicates that there has been an increase in antibodies and that the patient's resistance has been increased by the administration of the vaccine.
3. That all types of rheumatic infection are part of the same disease, that the clinical difference can be explained by the differences in age of the patients.
4. That a subjective symptom such as the relief of pain can be accepted as a therapeutic index in such a condition as chronic arthritis.

A review of the most recent literature reveals the fact that there is anything but agreement on the importance of the rôle of streptococcus in rheumatic disease. While it is true that such excellent investigators as Cecil and Clawson have found a high percentage of positive cultures from the blood of patients with both chronic arthritis and rheumatic fever other workers have not been able to repeat this work. Dawson and his coworkers working in the Presbyterian Hospital in New York City were unable to find the streptococcus in the blood of his patients with chronic arthritis. Dawson, in his effort to find positive cultures, went into Cecil's laboratory to study in detail Cecil's method of culture. He even went so far as to use Cecil's media and was still unable to find the streptococcus. Hench, at the Mayo Clinic, was equally unsuccessful in finding the streptococcus in his chronic arthritis. These are only a few of the negative reports which have appeared in the most recent literature on chronic arthritis. Coburn, in his book on "The Rheumatic State" reports his work on over four hundred blood cultures from cases of acute rheumatic fever. Coburn used twenty or more different methods

of culture and was unable to find a sufficient number of positive cultures to be significant. Cooley, working in the John McCormack Institute in Chicago, reported on his experience in studying the blood of twenty-five children during the acute stage of their first attacks of rheumatic fever. He used Clawson's method and was unable to find the streptococcus. I also have made cultures from the blood of thirty children with sub-acute rheumatic fever and have been unable to find the streptococcus. From this superficial and incomplete review of the most recent literature on the bacteriology of "rheumatism" it can be concluded that the streptococcus nor any other organism has been proven to be the etiologic agent in either chronic arthritis or rheumatic fever.

Students of this subject have long wondered exactly what significance the agglutination reaction had. Was it a specific action and did it indicate increased immunity? It must be remembered that the use of intravenous vaccine is based on the agglutination reaction. As has been shown, the agglutination titre went up in the treated patients and especially in those patients who had a favorable response. Tillets and Abernathy, working in the Johns Hopkins Hospital, have recently reported on some most interesting work which would indicate that the agglutination reaction is neither specific nor does it indicate increased immunity. They showed that the blood of patients with such variable infections as pneumonia, typhoid, undulant fever, tuberculosis, lung abscess, etc., showed a fairly high agglutination titre to the streptococcus hemolyticus. They further showed that the agglutination reaction went up during the acute febrile stages of many diseases and as the acute stage receded the titre went down. The agglutination titre went along with the sedimentation rate of the red blood cell. They concluded, with Reiman, that the agglutination reaction had something to do with the viscosity of the blood, that it is not a specific reaction and did not necessarily indicate increased immunity. So that it may be concluded that at the present time the agglutination reaction has not been proven to be specific nor that it indicates increased anti-body formation.

It has been claimed that all types of rheumatic infection are the same, the only difference being in the age response of the patient; that is, when a child is infected with rheumatism he develops rheumatic fever, that a young adult has atrophic arthritis, and that old people have the osteo-arthritis type of the disease. Surely from a clinical point of view these three types of "rheumatism" are distinctly different. I am quite sure that any student of this disease could walk through a ward and easily differentiate these different types. It is true that there is some overlapping, but for the most part they present quite distinct clinical pictures. There is anything but agreement on this phase of the subject. Cecil, Pemberton, the English investigators, Osgood and many others oppose the point of view that all types of rheumatism are part of the same disease.

Nicholls and Stansby, working with Cecil, have used the agglutination reaction to differentiate between atrophic arthritis and osteo-arthritis. They found a very high agglutination titre in the atrophic type and a very low titre or no agglutination in the osteo-

arthritic type. And yet some investigators have found as high a percentage of positive blood cultures in the latter type as in the atrophic arthritides. Here again is a controversy, an unsettled and unproved phase of the problem.

In regard to the last point, many forms of treatment give arthritic patients temporary relief. Typhoid vaccine, peptone, milk, many other foreign proteids, diathermy, etc., have given favorable results in the hands of many practitioners. One should like to compare the present types of treatment. One should like to know how the titre would go after typhoid injections in humans, also after long continued diathermy treatment. I believe that I have said enough to indicate to you that the whole field is in a very unsettled condition, that the etiology of rheumatism is unknown, that streptococcal vaccine is being used only as an experiment and not on proven ground.

DR. B. J. CLAWSON (closing): The question of desensitization, I am quite certain from experimental work and from what I have seen in patients, has been overdone and is really more of a theory than of any practical importance.

Of course we certainly would not insist that there is a specific strain of streptococcus that produces chronic arthritis. We do not insist that it is always streptococcus by any means. I think, however, in most cases the organism is likely to be streptococcus since this organism has been more commonly found than any others.

The question which Dr. Schaaf brought out about recurrences is certainly one to be observed. I think that to observe the patients over a period of two, four, or five years is really the only method we have of being sure we are getting results.

I am glad the subject of foreign proteins was brought up. From the standpoint of immunology I do not think we can show it has any advantage. It has been used, and I would not want to say it has had no advantage in the patient. It does produce a temperature. It warms the patient up and probably helps him, but the method seems to me to be a roundabout way to increase temperature. The typhoid bacillus is extremely dangerous. In my experimental work, I had a great deal of trouble in giving any dose of typhoid bacillus and keep from killing my animals.

Dr. Shapiro's objection to the etiology is justified. We may be wrong, we will admit. However, the streptococcus seems to be the most probable organism if the disease is an infectious one.

I would not say that agglutinins kill. We are studying the mechanism of the actual bactericidal power. I do think agglutinins are an indication that we are developing bactericidal power. We found this to be true in the patient and in the animal.

As near as we can get at it, our experience and experiments point toward the conclusion that the streptococcus is the most probable etiologic factor in most cases of chronic arthritis; that the intravenous method of vaccination is the best method; and that the agglutination reaction is the best indicator we have of the development of the bactericidal properties in the patient's blood.



## MASKED MASTOIDITIS\*

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**M**ASKED or latent mastoiditis, because of its frequency, its insidious type of development, its lack of the majority of the usual symptoms, is a disease that may present great difficulty in diagnosis.

It would seem that the term "latent mastoiditis" can seldom be applied, for it would imply a period completely without symptoms, and with no advance of the disease process. There is only one case in the series to be considered in this paper which would apparently meet these criteria. Although the type of case considered here has usually been termed latent mastoiditis in the literature, the term "masked mastoiditis," which is occasionally used, seems much the better and covers all those cases of mastoiditis presenting unusual difficulty in diagnosis.

The usual criteria for a clinical diagnosis of acute or subacute mastoiditis, judging from experience at The Mayo Clinic, in order of their frequency, are as follows: 1. There is tenderness over the mastoid process, either diffuse or else localized over the antrum, with a history of infection of the upper part of the respiratory tract, and apparent subsequent extension to the mastoid cells. 2. The soft tissues over the mastoid process are red and edematous. 3. There is drooping or sagging of the posterosuperior wall of the external auditory canal at its juncture with the tympanic ring, and the "dripping drum" described by Kerrison. 4. There is discharge from the external auditory canal, prolonged beyond the usual time of resolution of acute otitis media, which reappears immediately on being wiped away, as though coming from a large reservoir. 5. A fluctuating swelling appears in the mastoid region; namely, over the mastoid process, in the neck below the tip of the mastoid process, or above and anterior to the ear, over the root of the zygoma. 6. Lancinating pains are referred over the occiput, along the zygoma, into the neck or into the eye, and are

more marked at night, tending to disturb sleep. 7. Continued fever, often septic in type, is present.

These symptoms and signs may appear alone, in sequence, or in combination, and in the usual case of mastoiditis I have found at least two present even in the earlier stages.

After a review of the literature, it may be said that the principal signs and symptoms of latent or masked mastoiditis given by the various authors are as follows: 1. There is preceding infection of the upper part of the respiratory tract, with usually some symptoms of disease of the middle ear, separated in time from the appearance of symptoms referable to the mastoid process to a greater or lesser extent. 2. Great emphasis is placed by several writers on the general appearance of the patient, who loses weight, is weak, and is without appetite. There is also an almost unique expression of apathy. 3. Fever is often present, which may be intermittent or of the continued type. Some of the patients had been treated for several months for typhoid fever before a sudden discharge from the ear called attention to the true pathologic process present. This mistake was made previous to the general use of the agglutination test for typhoid fever. 4. Lancinating pain is referred to the occiput, along the zygoma, into the neck and into the temporal region. 5. There is drooping or sagging of the posterosuperior wall of the external auditory canal. 6. A tendency is present for impairment of hearing to be pronounced because of involvement of the inner ear.

### STUDY OF CASES

All the cases of acute and subacute mastoiditis in which operation was performed in the clinic from 1920 to 1930 were studied. In all, 585 cases were reviewed. These cases included all complications of mastoiditis such as meningitis, sinus thrombosis and embolism.

From the 585 cases, forty-one were selected which seemed to meet the criteria which would allow them to be distinguished from the ordinary

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case, a percentage of slightly more than 7 per cent.

Only cases which presented difficulty in diagnosis were selected. The signs and symptoms, when they appeared, were those less frequently associated with diseases of the mastoid process and were, therefore, not immediately associated with the underlying cause. The symptoms of mastoiditis gave such little subjective discomfort to the patients that they did not seek medical attention until some complication of mastoiditis had occurred. No case has been included in which there was not an interval of at least a month between any symptom of mastoiditis other than an occasional pain in the affected side, and the probable primary infection of the upper part of the respiratory tract.

It was thought that if the patients were considered according to the chief complaints with which they presented themselves, the difficulty presented in making a definite diagnosis in this condition would be emphasized.

*Swelling over the mastoid region.*—Typically, the patients who gave swelling in the mastoid region as their chief complaint, had been previously unaware that a pathologic process was present anywhere in their bodies, although usually their appearance suggested the presence of the infection. Only after the appearance of the mastoid swelling did any subjective symptoms of pain in the head, feeling of ill health, or sign of discharge from the ear begin. Two cases illustrative of this type of asymptomatic mastoiditis are as follows:

*Case 1.* A man, aged twenty-six years, came to the clinic with the history that three months previously he had had an attack of influenza which had confined him to the hospital. One month later, without obvious cause, he had had a severe pain in the left ear, and the membrane had ruptured spontaneously in three days, with relief of the pain. The discharge had continued for about two weeks and then had ceased. About one month later, a week before admission at the clinic, he had noticed pain in the left mastoid region, soon followed by a rather rapidly increasing swelling which had begun to subside again after three days.

Examination of the ear and nose disclosed that the left tympanic membrane was slightly full, with a generalized pink blush. There was concentric narrowing of the external auditory canal, with slight drooping of its posterosuperior wall. The tissues over the left mastoid were moderately edematous and there was exquisite tenderness to firm pressure over the entire left mastoid process. There was bilateral deafness of the stapes fixation type, more marked on the left than on

the right. General examination revealed nothing of importance. In a roentgenogram of the mastoids there was cloudiness on the left, graded 4 on a basis of 1 to 4. A diagnosis was made of mastoiditis, with beginning subperiosteal abscess on the left, and mastoidectomy was advised.

At operation, on uncovering the mastoid cortex, a perforation was found below and behind the external auditory canal. At the first stroke of the gouge, pus welled up under pressure. A large cavity full of pus, and infected granulations were found. The diseased tissue extended down to the sigmoid sinus, which was uncovered, and its surface was found to be thickly covered with granulation tissue. The antrum lay high, was deeply situated and small, and some difficulty was experienced in uncovering it. The mastoid cells were completely exenterated, the wound was closed in the usual manner, and myringotomy performed.

Convalescence was uneventful and the patient was dismissed in four weeks, with the ear completely healed.

*Case 2.* A man, aged thirty-six years, gave the history of the onset of complete deafness in both ears, without any apparent cause, four months before he presented himself for examination. He had consulted his local physician who had treated him with tubal inflation and nasal lavage, with relief of his complaint. A month following cessation of treatment, the patient had noticed painless swelling over the right mastoid region. He had felt run down and feverish but had been free of other symptoms. The swelling over the right mastoid region had gradually increased until about one month before he had come to the clinic. At that time, he had tasted something in his mouth, and had discovered that it was bloody pus. After this occurrence, the swelling had disappeared almost completely, but then had gradually reappeared.

On examination of the ears, nose, and throat, a firm, fluctuant mass was found over the right mastoid and upper cervical regions. The right tympanic membrane appeared slightly opaque and did not move freely with the otoscope. There was slight deafness, of conduction type, on the right side; hearing on the left side was normal. There was a small mass of granulation tissue in the right Rosenmüller fossa. In roentgenograms of the mastoids there was moderate, diffuse cloudiness on the right, with some air-filled cells present. General examination revealed well compensated mitral regurgitation, but otherwise results were negative. The diagnosis lay between malignancy of the nasopharynx and latent mastoiditis. The report on a specimen for biopsy, taken from the right fossa of Rosenmüller, was "inflammatory tissue." Exploration of the mastoid was advised.

At operation the periosteum separated with difficulty, and a well marked petrosquamous groove was present. The superficial cells of the mastoid were involved only a little, but on removing the tip, considerable pus was found under pressure. When pressure was exerted on the neck, pus welled up from below the sternomastoid muscle. A well developed petrosquamous lamina was found and the antrum was deeply situated and appar-

ently below it. The cells in the antro-apical groove were filled with pus and infected granulation tissue. The mastoid was completely exenterated and closed in the usual way. A drainage tube was placed in the cervical abscess and myringotomy was performed. In a culture from the mastoid, taken at the time of the operation, growth of a hemolytic streptococcus was obtained.

Convalescence was without incident, the wound was completely healed, and the patient was dismissed in four weeks.

The exciting cause of the mastoiditis in Case 2 was doubtless insufflation of the eustachian tube. The somewhat unusual type of cellular development of the mastoid probably played a part in concealing the symptoms.

It is probable that a case in which the chief complaint is swelling in the region of the mastoid should offer but little difficulty in diagnosis. However, when it is considered that mastoiditis was present at least a month before this sign appeared, and that there was very extensive destruction of the mastoid process in all cases in which this was the complaint, it is obvious that the diagnosis was completely concealed for a very considerable period, and that the connection between the sign and the causative disease might not be immediately apparent to one not especially concerned with otology.

*Lancinating pains.*—The cases in which lancinating pain was the chief complaint were all of long standing, and at operation the disease was found to have extended to the dura of the middle fossa, or of the sinus. The pain, typically, was much increased during the night and prevented normal rest. This phenomenon is probably due to the tendency of the intracranial pressure to increase during sleep, and thus for any dural irritation which may be present to increase. The pains are probably referred by the dural branches of the fifth nerve to the sympathetic connections, as described in the recent papers by Temple Fay. Two cases illustrative of this particular syndrome are presented.

*Case 3.* A man, aged fifty-two years, presented himself with the history that four months previously, he had had a discharge from the right ear which had lasted four days. There had been no preceding earache, or any illness which could be assigned as the causative factor. A month later, the same sequence of events had occurred, and from this on the patient had noticed slight deafness of the right ear. Two weeks before coming to the clinic, the patient had noticed a slightly tender swelling over the posterior portion of the right mastoid, and a lancinating type of pain

over this area, referred forward into the temporal region; the pain appeared usually at night, but was slightly noticeable whenever the patient was unoccupied. The patient also stated that he had not felt well for six months, and had been exceedingly sleepy for more than a month.

On examination, the right tympanic membrane was found reddened and bulging, with landmarks obscured. There was no drooping of the posterosuperior wall of the external auditory canal. There was tenderness to firm pressure over the region of the emissary vein of the mastoid, and slight edema of the soft tissues in this region. There was deafness of stapes fixation type on the right side. The remainder of the examination of the ears, nose, and throat gave negative results. General examination also gave negative results, except for a moderate degree of secondary anemia and an increase in the number of leukocytes to 9,000 in each cubic millimeter of blood. In a roentgenogram there was cloudiness of the right mastoid, graded 3.

A diagnosis of latent mastoiditis with probable parasinus abscess was made and mastoidectomy was advised. At operation, the cortex was found markedly sclerotic, and on removal of the first chip, pus welled up under pressure. The mastoid had been converted into a cavity filled with granulation tissue, and the dura of the middle fossa and the sigmoid sinus were uncovered over a wide area. The dura, where it was exposed by the disease, was covered with a thick layer of infected granulation tissue. The mastoid was completely exenterated, the tip was removed, and the dura was uncovered until tissue that appeared healthy was reached. Closure was made by the usual method, and myringotomy was performed. From material taken at operation from the mastoid wound pneumococcus, Type 3, grew in pure culture.

Convalescence was uneventful. The wound was completely healed, and the ear was dry at the end of three weeks.

Although the pneumococcus Type 3 was present, the course of the disease and the postoperative recovery followed the course usually seen in mastoiditis of long standing with the natural barrier to disease well established.

*Case 4.* A man, aged fifty-one years, gave the history that four months before admission at the clinic, without ascertained cause, a discharge from the left ear had begun. Discharge had continued for two months, and slight soreness of the mastoid occasionally had been present. The discharge then had stopped, and the patient had been free of symptoms for two months. At that time he had begun to have pain over the mastoid, with radiation of the pain to the parietal and occipital regions occurring usually at night and requiring sedatives for relief. Two days before he came to the clinic, he had noticed a slight discharge from the left external canal.

The left membrana tensa was found to be dull red, and no motion could be produced with the pneumatic otoscope. There was no mastoid tenderness. Deafness of stapes fixation type was present and equal on each

side. Examination of the fundus gave negative results. In a roentgenogram of the mastoids there was moderate cloudiness in the region of the cells on the left side. The patient was kept under observation for a week, and all symptoms disappeared completely. He was dismissed, but was advised to return if there was a recurrence of symptoms. He returned in two weeks, reporting that for a week he had had lancinating pains radiating over the left occipital and parietal regions.

Examination revealed slight bulging of the membrana tensa of the left ear, and there was slight tenderness on deep pressure over the mastoid emissary vein. Another roentgenogram of the mastoid was taken, and disclosed marked increase in cloudiness of the cells. General examination was negative, except for mild hypertension. A diagnosis of masked mastoiditis was made and mastoidectomy was advised.

The mastoid cortex was found to be very thin and the mastoid cells were extensively broken down and filled with pus and infected granulations. The disease had extended down to the sigmoid sinus, in the region of the lower turn, and the wall of the sinus was covered with granulation tissue. The mastoid was completely exenterated and closed in the usual manner, and myringotomy was performed. Culture of the mastoid wound was not made.

The patient had no febrile reaction after the operation and was dismissed in three weeks with the wound completely healed. There was nothing in the anatomic structure of the mastoid, as found at operation, to suggest a cause for lack of the usual symptoms.

**General weakness.**—Two patients presented themselves with no other complaint than that of general weakness. However, a generally run down appearance was characteristic of all patients with masked mastoiditis, sufficiently so, it seemed, to be of definite diagnostic significance.

**Case 5.**—A man, aged forty-four years, gave the history that a month previously, following an intranasal operation, he had had considerable pain in the left ear; the tympanic membrane had been incised, and a discharge had come from the canal for a day or two. He had noticed nothing further with direct reference to the ear, but a feeling of general malaise had persisted since that time, and he had had a chill, with fever, ten days before his admission at the clinic.

The patient appeared to be below normal physically, and his face had a drawn, anxious look. There was some constriction of the external auditory canal, with marked drooping of the posterosuperior wall, at the juncture of the external auditory canal with the tympanic membrane. Tenderness of the mastoid was not elicited. Deafness of the stapes fixation type was present on the left side. In a roentgenogram of the mastoids there was cloudiness on the left, graded 1. General examination gave essentially negative results.

At operation, the intercellular structures were not broken down but the cells were very large and filled with pus and infected granulation tissue. Over the lower knee of the sinus there was a parasinusous abscess.

The sinus was uncovered until dura of normal appearance was reached in all directions. The wound was closed in the usual manner, and myringotomy was performed. From material taken at operation from the mastoid wound a hemolytic streptococcus grew in pure culture.

The very large size of the mastoid cells was thought a possible explanation of the lack of symptoms. The patient was dismissed at the end of four weeks with the wound completely healed.

**Case 6.** A man, aged sixty-two years, presented himself with the chief complaint of loss of appetite, weight, and strength. A month previously, he had had a severe cold, and at about the fourth day he had noticed impairment of hearing on the left side. He had had a slight pain in the left ear, which had been present occasionally since. The deafness had persisted to the time of admission. There was no aural discharge.

On examination, several furuncles were found in the canal of the left ear, but except for slight dullness, no change was noted in the tympanic membrane. Otherwise, examination of the ears, nose, and throat and general examination gave essentially negative results.

The patient came for observation and treatment at irregular intervals, and at the end of a month the furunculosis of the canal had completely disappeared, and the general condition had markedly improved. A month later, however, the patient returned with a discharge from the ear which had been present two days, and he complained of pain in the left side of his head, of a throbbing type, which characteristically was much worse at night, disturbing rest. At the end of a week, slight tenderness appeared on deep pressure over the mastoid antrum.

In a roentgenogram of the mastoids there was slight clouding of the outlines of the air cells on the left, graded 1. Because of the patient's age, the long history, and the nocturnal pain, exploration of the left mastoid was advised.

On uncovering the cortex, generalized petechial bleeding was encountered. The cortex was thin, particularly so for a man aged sixty-two years, and on removing the first chip, pus under pressure welled up, apparently from the region of the upper knee of the sigmoid sinus. The mastoid was cellular and very extensive. The mastoid cells were completely exenterated, the involvement being particularly marked in Trautman's triangle and the root of the zygoma. The upper knee of the sigmoid sinus was uncovered, and the wall was found to be thickened, but as there had been no apparent symptoms of involvement of the sinus it was not further disturbed. A pack was placed in the mastoid, the wound was closed in the usual manner, and myringotomy was performed. From material taken at operation from the left mastoid, *Diplococcus pneumoniae*, Type 3, grew on culture.

The patient's course was without incident for five days, and on the fifth day the pack was removed from the mastoid. A 9 P. M. on the sixth day, the patient's temperature rose to 102° F. and he complained of pain in the region of the mastoid wound, and on deep res-

piration, in the right posterior aspect of the thorax. There was dullness to percussion at the base of the right side of the thorax, and in the axilla. A diagnosis of acute pleurisy was made and the thorax was strapped. The patient had a vivid impression of impending dissolution previous to the operation, which had persisted through his convalescence, but until the appearance of the pleuritic pain there had been no objective intimation of trouble. The patient failed rapidly and died on the seventh day after operation, apparently of acute cardiac failure. Permission for postmortem examination was refused.

It seems possible that wide uncovering of the sigmoid sinus in this case might have revealed involvement of its interior, particularly at the region of the bulb. Judging from the rapidly fatal course, it seems probable that pleurisy was secondary to septic infarction of the lung. This was an early case in the series, and thorough exploration was not practiced then as at present. Cases 5 and 6 were especially striking in that only after close questioning could a history of previous trouble with the ear be elicited.

In the following case, the only one of its type in the group, the patient presented himself with the history of an earache and running ears, and while he was under observation at the clinic a masked type of mastoiditis developed, but the diagnosis of this was not made for about two months.

*Case 7.* The patient was a man, aged forty years, who presented himself with a bilateral earache of four days' duration, which had come on in the course of an acute attack of coryza. On examination, both tympanic membranes were found to be perforated, and there was a moderate amount of discharge in both external auditory canals. A large solitary polyp was found blocking the left nasal cavity. After ten days, inhalation of steam and rest in bed, the condition of both ears apparently cleared up without difficulty. A week later, the large polyp in the left nasal cavity was removed, without untoward reaction.

The patient returned to the clinic in a month and a half with the complaint of pain which had been present in the left ear for four days. The tympanic membrane of the left ear was slightly red, but not bulging. Tenderness of the mastoid was not elicited. Under observation for two days the condition apparently cleared up, and the patient was dismissed.

In two weeks, the patient returned, with the complaint of renewed aching which had been present in the left ear for two days. On examination, the left tympanic membrane was moderately red. There was concentric narrowing of the external auditory canal on the left side. Slight edema existed over the left mastoid, and there was moderate tenderness on deep pressure at a point overlying the antrum. Examination of

the ears, nose, and throat was otherwise negative. General examination gave no positive findings. A roentgenogram of the mastoid regions appeared to represent a normal condition on the right, but there was a large area indicative of absence of bone on the left, which was thought to represent complete destruction of the interior mastoid process.

At operation, on incising the soft tissues, pus escaped from the upper end of the incision, and the tract appeared to lead to the posterosuperior wall of the external auditory canal. The mastoid cortex was sclerotic, and there was eburnation of the tip. There was a cavity in the upper portion of the mastoid, 2.4 cm. in diameter, filled with infected granulations; the disease extended down to the upper turn of the sigmoid sinus and to the dura over the temporal lobe. The antrum, small and deeply situated, was found with some difficulty. The sinus and the dura of the middle fossa were uncovered in all directions, until tissue of normal appearance was reached. The wound was closed in the usual manner, and myringotomy was performed.

From material obtained from the mastoid wound *Diplococcus pneumoniae*, Type 3, grew in pure culture.

Convalescence was uneventful and the patient was dismissed in four weeks with the canal of the ear dry and the postauricular wound healed.

The sclerotic condition of the mastoid suggested the possibility of previous infection of the process, but no history confirming this supposition could be elicited. It is possible that the degree of sclerosis observed might have been produced during the two months the disease was present. The apparent great destruction of the mastoid that was shown in the roentgenogram was not found at operation. Untoward effects were not produced by closure of the wound over a pack, in spite of the presence of the pneumococcus, Type 3.

*Continued fever.*—Perhaps the most bizarre case in this series was one which was referred to the clinic. This was the only case in this series in which the chief complaint was of continued fever; it was the only one in which the disease was bilateral, and, in our experience, it was the only one which seemed to present true latency. It will now be reported.

*Case 8.* A woman, aged twenty-two years, stated that one year previous to admission she had had a severe case of scarlatina complicated by quinsy, and she had been under quarantine for four weeks. She had returned to her work after a month, but had felt weak and had tired easily. After working for about one month, she had begun to run a continuous temperature of 102° to 104° F., but without localizing symptoms. The fever had subsided in three to four weeks and she had felt perfectly well. Six months later, she had had a chill, followed by a continuous temperature of 104° F. but no obvious cause could be found. After three months, she was referred to the clinic.

At the time of the patient's admission, her temperature was 101° F. and she appeared very ill. General



examination gave negative results. She was immediately hospitalized, and agglutination tests made for typhoid fever, tularemia, and infection with *Brucella melitensis*, variety abortus, were found negative. Blood smears taken for infestation with protozoa, and a blood culture, were negative. On repeated analysis, the urine was normal.

The patient was then sent for examination of the ears, nose, and throat, with the thought that symptomless sinusitis might be responsible for her condition. On examination, the left membrana tensa was found to be slightly reddened, and there was slight bulging in the region of Shrapnell's membrane. Slight tenderness was noted on deep pressure over the tip of the left mastoid process. Slight redness along the handle of the malleus on the right was noted. Otherwise, examination of the ears, nose, throat, nasopharynx, and larynx did not reveal a pathologic condition.

After close questioning, the patient recalled that on three or four occasions in the six months just passed, she had noticed a rather peculiar interference with her sense of hearing in the course of choir practice. This was the only history obtainable with reference to the ears. A tentative diagnosis was made of latent mastoiditis and the patient was observed further. Roentgenograms of the mastoids and sinuses were negative. The redness of the left membrana tensa gradually increased, and bulging was apparent. Myringotomy was performed four days later, and this was followed at first by a serous discharge. Because of the almost symptomless advance of the condition, suspicion arose that the condition might be due to presence of organisms of tuberculosis, and material was taken for inoculation of guinea pigs. On killing the pigs five weeks later, no evidence of tuberculosis was found. The discharge from the right ear became more pronouncedly purulent, and tenderness of the mastoid more acute. Another roentgenogram of the mastoids disclosed that the outline of the mastoid cells on the left side was slightly cloudy. Four days after myringotomy, drooping of the posterosuperior wall of the external auditory canal was noted. However, the discharge from the ear began to decrease and the tenderness of the mastoid gradually lessened. Since the continued fever showed no signs of remission, and drooping of the superior wall of the external auditory canal persisted, a definite diagnosis was made of latent mastoiditis, and mastoidectomy was advised.

At operation, the left mastoid was found to be extensive, and of the small-celled variety. The cell-walls were sugary, and the cells were filled with granulation tissue which bled easily, but the septums were not broken down. The antrum was easily found and was seen to be filled with granulation tissue. No frank pus was obtained, although the mastoid cells were completely exenterated. The sinus was purposefully uncovered but was in normal condition. Material was taken from the mastoid wound at operation, and a hemolytic streptococcus grew on culture. Transfusion of 500 c.c. of citrated blood was given the day following the operation in an effort to combat the patient's marked anemia.

The fever did not subside after the operation, although blood cultures were repeatedly negative. Gallop rhythm was noted at the apex of the heart, and the presence of malignant endocarditis was suspected. The condition of the mastoid wound continued to be very satisfactory in appearance. The ocular fundi were negative, and neurologic examination did not give any positive findings. Transfusion of blood was repeated with no observable effect.

Ten days after the mastoidectomy, a whitish, necrotic area appeared in the posteroinferior quadrant of the right membrana tensa. The hearing in the ear was normal to the whispered voice and to the tick of a watch. There was increase in bone conduction, although the hearing as tested by tuning forks of both high and low pitch was not decreased. The following day, slight redness of the right membrana tensa, with some bulging confined to the posterior quadrant, was found, but the anterior portion appeared normal, except for engorgement of the surface vessels.

Myringotomy was done on the right side, and pus escaped under marked pressure. Following this, there was a slight fall in the temperature, but in two days the temperature returned to its usual level of 102° to 130° F. On inspection, no drooping of the posterosuperior wall of the right external auditory canal and no tenderness of the mastoid were noted. Due to the similarity of events with reference to the two ears, however, exploratory mastoidectomy was advised.

At operation the same type of mastoid was found as on the other side, but with much more marked breaking down of the cells, which contained a quantity of pus. The cells extended posteriorly to the sinus, and on the posterior aspect of the wall of the sinus a parasinus abscess was found. In removing the bone over the abscess, the sinus was accidentally opened, but bleeding was controlled by a pack. The mastoid was completely exenterated, the wound packed in the usual manner, and myringotomy performed. A culture made of material taken from the mastoid at operation contained a hemolytic streptococcus. Transfusion of 500 c.c. of citrated blood was given immediately following the operation. The temperature returned to normal, remained so for a week, and the wound on the left side healed completely. On the evening of the seventh day after the operation on the right side, the patient complained of severe occipital headache. The pack over the sinus was immediately removed, but the sinus appeared in good condition. The dressing was followed by a rise in temperature to 101° F. but this subsided again on the following day. The patient became drowsy, and four days later complained of double vision. Examination of the eyes revealed bilateral weakness of the external rectus muscles, and examination of the ocular fundi disclosed bilateral choked disks of 2 to 3 diopters, with hemorrhages and exudate.

The amount of discharge from the canal and postauricular wound suddenly increased, and drainage was profuse, with simultaneous improvement in the patient's symptoms and subsequent fall in the temperature. It was thought that an epidural abscess was present which had begun to discharge, with consequent release of



pressure. However, neither the discharge nor the patient's improvement continued. Slight rigidity of the neck developed, the weakness of the external rectus muscles became even more marked, and the bilateral choking of the disks increased to 4 diopters. Neurologic examination revealed nothing but hyperactive reflexes on the left side. Because of the possibility of the presence of a brain abscess, spinal puncture was not done. Drowsiness increased and occipital pain became more marked.

One month after the second operation, the patient complained of a sensation of numbness in both arms. No deep reflexes could be elicited on neurologic examination. Discharge from the canal had disappeared and the postauricular wound was healed. The patient's condition remained stationary, and it was decided to explore the right temporal lobe.

Exploration was made through a subtemporal opening but pus could not be found. However, on opening the dura, cerebrospinal fluid escaped under marked pressure. Following this, the patient's condition steadily improved, the choked disks and the palsy of the external rectus muscles disappeared. The patient was dismissed in a month after the decompression, with all neurologic signs approaching the normal.

The period of absence of signs and symptoms referable to the ear was a full year from the time of the probable introduction of the organism responsible. The organism must have remained in the mastoids for considerable time, during which the relationship of microorganism and patient must have been one of virtual symbiosis. It is difficult to be certain whether this is an evidence of low virulence on the part of the invading organism or of unusual powers of resistance on the part of the host. There was nothing unusual about the anatomy of the mastoid to account for the condition, and the organism found in both mastoids was a hemolytic streptococcus. This case also illustrates very well the fallacy of depending on roentgenographic findings for diagnosis.

#### COMMENT

Eleven of the patients were women and thirty were men. The average age of the patients was thirty-seven years; the youngest patient was seven years and the oldest, sixty-seven years. In twenty-four cases the left mastoid region was affected; in sixteen, the right, and in one, both right and left. In all the cases, a history of previous disease of the middle ear or of infection of the upper part of the respiratory tract could be obtained. The average length of time from the primary infection, until a diagnosis of mastoiditis was made, was three and one-tenth months; the

longest time was twelve months, and the shortest, one month.

Patients presented themselves with various chief complaints. Swelling over the mastoid process was present in nineteen cases. Lancinating pain was the chief complaint in fourteen cases. This symptom appeared sooner or later in the majority of cases in which extensive dural involvement was found at operation. Dull pain in the affected side was the chief complaint in three cases; generalized weakness in two cases; tinnitus and deafness in one case; continued fever in only one case, and recurring earache in one case.

There were eighteen cases in this series in which cultures of the mastoid wound were made at operation under sterile precautions. A pure culture of organisms was secured in each instance considered. Of these, it was found that in four cases the staphylococcus was the causative organism; in eight cases, a hemolytic streptococcus, and six cases, the *Diplococcus pneumoniae*, Type 3.

That there is an anatomic factor tending to produce mastoiditis of a comparatively symptomless type, seems probable. At operation in eight cases, marked sclerosis of the mastoid cortex was found. In these cases the patients were in the fourth decade of life or beyond. There were twelve cases in which a well developed petrosquamous lamina was found. In fourteen cases, there was such marked destruction of the mastoid process by the disease that no conclusions as to the influence of the anatomic structure on the course of the disease could be drawn. There were six cases in which the structure of the mastoid apparently played no part in the production of unusual symptoms.

Drooping of the posterosuperior wall of the external auditory canal was found in twenty-four cases and no suggestion of drooping could be discovered in seventeen. Tests of hearing were not of marked diagnostic importance. Tenderness over the mastoid process was usually not present until very late, and often could not be elicited.

*Complications.*—In eighteen cases there was parasinuous abscess, and in four, in addition, epidural abscess. Extension to the interior of the jugular vein occurred in only one of these cases and there were no instances of intradural extension except as noted in Case 8. Characteristically, the meninges were covered with a very

thick layer of granulation tissue which seemed adequate to prevent further extension of the disease.

Extension of the disease to the dura over the sinus, or over the middle fossa, in this type of mastoiditis at least, is not of itself of serious prognostic significance. Of great significance, however, is operative exposure of involved meninges until tissue of normal appearance is reached. A point of technic, suggested by Lillie, and that should be particularly stressed, is that sufficiently wide exposure of the dura be made to allow the intracranial pressure to tampon the dura down into the region of dehiscence, thus preventing seepage to uninvolved areas.

**Fatalities.**—Three of the forty-one patients with masked mastoiditis died, giving a mortality rate of 7.3 per cent, as compared to a mortality rate of 3.2 per cent for the whole series of 585 cases of acute and subacute mastoiditis including complications. Of the three cases mentioned, one has been presented in full (Case 6). Another patient with probable labyrinthitis had nausea and vomiting associated with transient attacks of vertigo for three days before admission, and complete nerve deafness was noted at examination. The labyrinth was not drained at the operation. The patient died of purulent meningitis the third day following the operation. The labyrinth was not examined postmortem. Still another patient with bilateral thrombosis of the cavernous sinus was seen three months after the probable initiation of the disease. He had slight rigidity of the neck when first seen, and although immediately operated on, he died of purulent meningitis the third day after operation. Additional findings at necropsy were extensive osteomyelitis of the bones at the base of the skull, including the body of the sphenoid bone, and the sphenoid sinuses were filled with pus. There was

also a septic thrombus in the superior petrosal sinus on the side of the mastoiditis.

All of the deaths occurred in cases in which the *Diplococcus pneumoniae*, Type 3, was present. However, in the uncomplicated cases in which this organism was present and in which complete exenteration of the mastoid was done, no variations from the normal course of recovery were seen. Therefore, it may be concluded that although the *Diplococcus pneumoniae* is an organism of the greatest virulence, no alterations in technic are necessary in its presence. In the two cases which offered possibility of cure pre-operatively, it may be argued that if a more extensive operation, completely fulfilling the requirements of free drainage of all infected foci, had been carried out, the chance of survival would have been greatly enhanced.

#### CONCLUSIONS

1. Masked mastoiditis occurs with sufficient frequency to make its recognition of significance (slightly more than 7 per cent of all cases of acute and subacute mastoiditis).
2. Masked mastoiditis may present the greatest difficulty in early diagnosis.
3. There is no single sign or symptom of unique diagnostic significance in this disease.
4. Anatomic factors seem to be of significance in producing some cases of this disease.
5. Other organisms than the *Diplococcus pneumoniae* may produce insidiously advancing mastoiditis.
6. The technic of mastoidectomy does not need to be varied according to the bacteriologic findings.

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## MODERN ASPECTS OF THE SURGICAL TREATMENT OF UROGENITAL TUBERCULOSIS\*

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THE past few years have witnessed a changing attitude on the part of the medical profession concerning the surgical treatment of tuberculosis of the urogenital system.<sup>1</sup> This has come about as the result of careful clinical studies of the earlier stages of urogenital tuberculosis and the use of this information in the medical and surgical treatment. The pathological and experimental aspects of the earlier lesions have been thoroughly studied by Medlar,<sup>3</sup> and Medlar and Sasano.<sup>2</sup> In previous communications<sup>4</sup> we presented the results of clinical studies of large numbers of tuberculous individuals in whom we attempted to discover early lesions of renal tuberculosis and to evaluate these findings in the light of all available experimental and pathological data. In these communications we called attention to the following:

1. Tuberculosis is a constitutional disease, urogenital infection being only a local manifestation.
2. Renal tuberculosis is practically always hematogenous in origin and may be primarily a bilateral implantation.
3. Tuberculous lesions in the kidney may be destructive or inflammatory; the inflammatory lesions may heal.
4. Tubercle bacilli may not be found at all times in the urine of patients with renal tuberculosis.
5. Tubercle bacilli in the ureteral catheterized urine from the kidney pelvis denotes renal tuberculosis.

6. A normal kidney can not eliminate tubercle bacilli so that excretory bacilluria does not occur.

The following report is an attempt to further crystallize the available data concerning the surgical treatment of urogenital tuberculosis.

### PATHOLOGICAL ANATOMY OF THE INVASION AND EARLY LESION OF TUBERCULOSIS IN THE KIDNEY

Renal tuberculosis develops from an hematogenous implantation of tubercle bacilli in renal tissue. We have learned to recognize pathologically, anatomically and by pyelograms, two types of tuberculous lesions in the kidney. One may be inflammatory, non-destructive or only slightly destructive. These are not visualized on the pyelogram. The other, a later stage of the former, becomes an ulcerative or more destructive lesion, which may never heal. These lesions, depending on their size and location, produce various sized filling defects in the pyelogram. They may be divided into ulcerative, which occurs at the tip of a pyramid; parenchymal abscess, the most common lesion; and tuberculous pyonephrosis. Medlar found, after sectioning entire kidneys, that lesions occur more frequently in one zone than in another. He concluded that the site and the size of arterial emboli apparently determines the type of lesion which will result. According to this work the most frequent site of implantation, and, therefore, the most common lesion, is in the cortical zone of the kidney. This lesion begins in a glomerulus<sup>5</sup> or tubular capillary where the emboli of necessity must be small and here abscess formation is almost unknown. These are usually discreet lesions that tend to encapsulate and fibrose but they may coalesce. They do not involve the medulla and infrequently result in the presence of tubercle bacilli in the urine, unless extensive necrosis occurs. The next most frequent site is in the cortico-medullary, or intermediate zone of the kidney, where the blood vessels and emboli are somewhat larger and where necrosis with bacilli in the tubules and in the urine occurs frequently. These lesions start in the region of the arcuate arteries, are usually fan-shaped and have a tendency to coalesce. They spread by way of

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the tubules and produce the most extensive destruction. The least frequent site of implantation is in the true medullary zone of the kidney where subsequent abscess formation is relatively frequent. These lesions start in the pyramidal vessels or are an infection through a tubule from a destructive cortical lesion. Clinically, we feel that the size and site of infected emboli, plus the constitutional resistance of the patient must, to a considerable degree, determine whether a given patient will develop an inflammatory non-destructive or a destructive type of lesion. If we accept the hematogenous origin of renal tuberculosis, then there certainly must be some determining factor, or factors, such as we have just mentioned, to account for the apparent discrepancy in the incidence of bilateral involvement in the early and late types of lesions. In published reports 70 per cent of all patients seeking relief from cystitis and an extensive destructive type of renal tuberculosis have a unilateral renal lesion, while 30 per cent have bilateral lesions. We doubt the accuracy of these reports because not infrequently the diagnosis is made after only one urological examination. Sixty-five per cent of our carefully studied series of tuberculous individuals presenting the earlier lesions of renal tuberculosis have bilateral involvement. Incomplete diagnosis, marked difference in the age of the two types of lesions and the possibility that frequent complete healing occurs with the early, slightly destructive or non-destructive ones, may explain the numerical difference in bilateral involvement noted. In our opinion excretory bacilluria does not occur; i.e., the normal kidney does not pass tubercle bacilli without the development of lesions of tuberculosis. Involvement of the second kidney in bilateral renal tuberculosis need not be explained by an elaborate process of retrograde extension up the ureter. It is better explained by the subsequent hematogenous extension from lesions already present in the second kidney or from repeated showers of infected emboli having their origin in a focus in the chest.

#### DIAGNOSIS OF RENAL TUBERCULOSIS

A genitourinary history in the diagnosis of the early lesions of renal tuberculosis is of little value. The majority of our patients give no history of complaints referable to the urinary or the genital tract. A history that suggests that tubercle bacilli may have entered the blood stream

from some lesion in the chest signifies that the kidneys may be infected, or may have been infected. A history of a previous tuberculosis is significant.

*Symptoms.*—Text book descriptions and statements appearing in published articles, of the first symptoms of early renal tuberculosis are erroneous. Frequent, painful, burning urination with pus in the urine are in fact symptoms of cystitis, a secondary and frequently late complication of renal tuberculosis. Hematuria, which would immediately lead one to suspect the kidney, occurs infrequently with the early lesions. In the majority of early cases a diagnosis of renal tuberculosis is made before symptoms have developed that signify bladder involvement.

Experience gained from the physical examination of normal individuals has revealed that the early lesions of pulmonary tuberculosis may be found in a patient who has no symptoms. This is applicable in the diagnosis of renal tuberculosis so that we begin the search for early renal lesions in patients who have no urinary symptoms. Every physician and surgeon interested in the diagnosis and treatment of tuberculosis should realize that lesions may develop insidiously in the kidney.

*Urological Survey.*—Repeated complete urological examinations is the best method of determining the presence or absence of ulcerative or destructive lesions of tuberculosis in one or both kidneys. They will determine when surgical treatment is indicated or contraindicated. In our opinion insufficient data obtained during one urological examination are the cause of the high mortality following nephrectomy. This mortality is noted during the first two years after operation and suggests that many patients are operated on when an undiscovered lesion is present in the second kidney and before the surgeon is sure that the patient has sufficient defense against tuberculosis. The chief reason why more bilateral lesions are not discovered is because the patient is not repeatedly examined. Every patient who has had tuberculosis in any form and who has cellular elements in his catheterized urine should be subjected to repeated urological study, providing his general condition will permit. A combined phenolsulphonphthalein functional test and complete blood chemistry studies should be made before cystoscopy is undertaken. Roentgen-ray examination of the en-



tire urinary tract, which is a routine procedure before cystoscopy, has not been helpful in the diagnosis of the early renal lesions of tuberculosis. An old pyonephrosis, or a large destructive lesion which has practically destroyed the kidney, may contain enough lime so that a mottled shadow typical of renal tuberculosis may be obtained. This is not found with the early lesions.

Cystoscopy must be carefully done and the data obtained properly interpreted. Reflux or contamination of the ureteral catheter has been assigned as the cause of the large number of bilateral lesions which we report. Reflux has occurred in 11.5 per cent of all the patients that we have cystoscoped. In a previous paper we called attention to the very careful technic of cystoscopy and ureteral catheterization which we practice. We advised flushing the ureteral catheters with sterile water during their passage through the cystoscope, the bladder and the ureter, together with a test for reflux. This in brief is done by over-distention of the bladder with methyl blue solution after the passage of ureteral catheters, and before the ureteral specimens of urine are collected. If an incompetent ureterovesicle valve is present, methyl blue will pass up the ureter and return through the ureteral catheter. When this occurs it is evident that the specimen is contaminated. This technic should eliminate to a great extent the possibility of contamination of urine specimens or their incorrect interpretation.

**Laboratory Data.**—During cystoscopy large specimens of urine should be obtained from each renal pelvis. A smear of the sediment should be examined after staining by the Ziehl Neelsen method. If no tubercle bacilli are found the sediment is injected into guinea pigs. The technic of the guinea pig test as we use it has been previously reported. Failure to find tubercle bacilli in smears of urinary sediment from catheterized specimens does not rule out tuberculosis. Tubercle bacilli may be present in only one of fifty slides examined. The injection of the sediment into guinea pigs, or culture, are more accurate tests but here negative findings do not necessarily mean that no lesion of tuberculosis is present. We know from experience that the excretion of tubercle bacilli into the urine from a parenchymal abscess is frequently intermittent. In a paper previously published we drew attention to the

necessity of the injection of sediments obtained from several weekly specimens of urine, two of which were from twenty-four hour collections, into the same animal so that we might find tubercle bacilli when present in small numbers.

**Functional Tests.**—Indigo carmine and phenol-sulphthalein are of little value in making a diagnosis of the early lesions of renal tuberculosis. When much destruction has occurred from a tuberculous pyonephrosis there may be a definite lessening of the function.

**Urography.**—We have been criticized because we make repeated bilateral pyeloureterograms in renal tuberculosis. We have made hundreds of pyelograms without observing the spread of tuberculosis into or from the kidney. We have not observed miliary infection or meningitis following, or as the result of, retrograde pyelography. However, this examination should be done very carefully. We try to insert the ureteral catheters so that the eyes are within the renal pelvis and not in a calyx tip or low in the ureter. This encourages complete drainage of the pelvis so that after a measured amount of sodium iodide is injected all of it may be withdrawn by syringe immediately after the film is exposed. Two syringes are always used, which prevents contamination from one kidney to the other and facilitates easy injection. We know of no method of examination that will reveal the presence of tiny macroscopic ulcerative or destructive lesions of the kidney as constantly as the pyelogram. By this method we have been able to find small ulcerative lesions and parenchymal abscesses when a specimen of urine obtained from the same kidney did not contain tubercle bacilli. Repeated bilateral pyeloureterograms are necessary because if only one kidney is examined the surgeon may overlook an unsuspected lesion in the other. The pyelogram has helped to estimate the relative amount of local defense against tuberculosis manifested by the kidney. Repeated pyelographic examination of destructive lesions has taught us that the kidney may develop a local resistance or defense mechanism of considerable degree. If a patient has a good local and general resistance a destructive tuberculous lesion of the kidney may be held in abeyance or progress slowly. When the local defense and the constitutional resistance is slight the kidney may be quickly destroyed. These changes may be accurately followed by pyelography only. There is plenty of time avail-

able for careful study of the patient's urinary tract before surgical treatment is undertaken. Except for hemorrhage and an obstructed ureter with pain and toxemia, surgical treatment in renal tuberculosis is never an emergency procedure. Repeated pyelograms reveal that a patient may have a destructive renal lesion of tuberculosis for months, and years, without demonstrable symptoms.

In our clinic the intravenous method of urography has not been particularly valuable. It does not visualize the minor filling defects which may be observed with the retrograde method. This method is useful when it is impossible to cystoscope a patient, or to catheterize both ureters because of an obstruction or stricture. In these instances pyelography would be impossible without the intravenous method.

#### LOCAL AND GENERAL DEFENSE MECHANISM AGAINST TUBERCULOSIS

Before deciding upon surgical treatment for destructive, unilateral renal tuberculosis the patient's general condition and his resistance to lesions of tuberculosis must be considered. Tuberculous individuals receive constitutional treatment so that they may develop resistance against tuberculosis and thus control their infection. For this reason every patient should have manifested his ability to control this disease before surgical treatment is advised. Although we have never been able to prove that a macroscopic destructive renal lesion of tuberculosis heals completely we have much pyelographic evidence that the development of a very definite local defense may occur. We have observed destructive lesions that did not progress over a period of years. Many specimens examined after nephrectomy contain lesions of tuberculosis that are completely walled off from the rest of the kidney. In many of these we had great difficulty finding other areas of tuberculosis in the good portions of the kidney. The question of resistance against tuberculous infection and the arrest and possible cure of some lesions should be carefully considered before a kidney with a small destructive lesion that does not progress is removed, as much good kidney tissue may be unnecessarily sacrificed.

#### SURGICAL TREATMENT IN GENERAL TUBERCULOSIS

Among physicians and surgeons there is a lack of understanding regarding the role of surgical

treatment in the cure and the arrest of all forms of general tuberculosis. For many years tuberculous patients, particularly those with pulmonary disease, were considered unsuitable subjects for surgical intervention. Many patients so handicapped remained unaided because they were denied the benefits of surgical treatment. Today this attitude has been somewhat modified so that we frequently encounter evidences of over-enthusiasm with instances of ill-advised and injudicious use of surgical treatment in this field. The greater one's knowledge of the destructive effect of lesions of tuberculosis, the greater becomes one's respect for its potential possibilities for doing harm. Likewise, the more the physician or surgeon knows about a given individual's resistance against this disease the more intelligently he may be able to plan and direct the surgical treatment.

A rather conservative attitude toward surgical treatment in the tuberculous individual may be briefly summarized as follows: Tuberculosis is primarily a constitutional disease with local manifestations in various organs. It is rarely possible to extirpate all of a given individual's tuberculosis, so that in general it may be stated that surgical treatment does not cure but is an aid in obtaining a clinical result.

Recent or acute pulmonary tuberculosis with the exudative types of lesions presents a very treacherous field for surgical attack, if attempted before the patient has mobilized his powers of resistance. Radical surgical treatment at this time may not benefit the patient but may be the direct cause of a marked exacerbation of the disease which leaves him far worse than before surgical treatment was instituted. The chronic fibrotic stages of the disease offer a safer field for surgical intervention, but here, as well as during the acute stages, the surgeon must recognize that any trauma which greatly lowers the patient's local or general resistance may be followed by a lighting up of an apparently quiescent tuberculous lesion, either locally or in some distant organ. The careful selection of patients, as well as the time of operation, is of paramount importance if surgical treatment is to be undertaken. A very careful surgical technic, which includes gentleness in handling of tissues, the avoidance of shock and unnecessary trauma and careful pre-operative and postoperative treatment, is imperative. The avoidance of anesthetic

trauma to the lungs by inhalation anesthesia is necessary because this may reactivate quiescent pulmonary disease. Surgical trauma may be a causative factor in the metastasis of tuberculosis to various portions of the body. Tuberculosis rarely presents indications for emergency operations, so that plenty of time may be taken for complete diagnosis and for the arrangement of conditions most favorable to the patient contemplating surgical treatment. It is a well recognized fact that tuberculous individuals recover from all illnesses and surgical treatment more slowly than others. Postoperatively, therefore, they must be given sufficient time to make complete recovery from their surgical treatment, so that any residual infection or any lesions activated by the surgical manipulations may become quiescent. It is evident that tuberculous individuals require more careful management than average individuals. However, if their special problems are recognized and evaluated it is surprising how much surgical treatment has to offer them. Many of the surgical principles which apply in the treatment of pulmonary and general tuberculosis are applicable in the surgical treatment of urogenital lesions.

#### TREATMENT FOR UNILATERAL DESTRUCTIVE RENAL TUBERCULOSIS AND THE TECHNIC OF NEPHRECTOMY

Unilateral extensive destructive lesions of renal tuberculosis require nephrectomy but only at a time when the operation may be done with the least danger to the patient. Unilateral and bilateral non-destructive lesions of renal tuberculosis are medical conditions and should have intensive medical treatment. Unilateral slightly destructive renal tuberculosis should be treated conservatively under careful observation. Nephrectomy is indicated only when progressive disease is present.

We use spinal anesthesia whenever it is possible, as it produces no lung irritation, less trauma to the tissues during removal of the kidney, better exposure, and thus more rapid operative procedure.

The fat surrounding the kidney and as much of the ureter as possible is removed. The ureter is incised with an endotherm knife, tied, and the remaining stump injected with pure carbolic acid. The carbolic acid sterilizes the ureter so

that it may not become a factor in subsequent infection of the wound, in the production of a sinus, or in continuing infection of the bladder. When the ureter is obviously infected or dilated a hollow tube gutta percha drain is slipped around the cut end of the distal stump where it is held by a chromic gut ligature. This is allowed to remain for at least three weeks. If the ureter is not infected no drain is used. When the ureter is being treated, we are very careful to protect the surrounding tissue from contamination. The end of the ureteral stump attached to the kidney is covered with a small piece of hollow tube drain, so that contamination of the wound may not occur from this source. Drainage of the kidney fossa or the incision is unnecessary.

Close, accurate approximation of the several tissues of the wound should be made with care. Figure of eight braided silk tension sutures embracing all tissue layers, including the fascia and skin, tied over large pearl buttons have been comfortable and satisfactory. These sutures, tied in bow knots so that they may be adjusted at will, may be left in the wound for six to eight weeks.

Re-opening of the incision following nephrectomy for renal tuberculosis occurs in the patient who has little or no resistance, and is the result of perinephritic involvement at the time of operation, contamination of the incision by an accidentally opened ureter or kidney pelvis, rupture of an abscess or, rarely, from a residual tuberculous ureter. If the patient has sufficient resistance, many of these factors will not become operative, so that the wound will heal completely and permanently.

Chronic sinuses that may develop following removal of a tuberculous kidney are excised with the endotherm knife so that complete exposure of all ramifications is attained. Every portion of the wound surface is then thoroughly destroyed with bipolar diathermy. Following this, the wound is packed with sterile gauze without suturing and is repacked and treated with actinic light daily. Aseptic precautions must prevail during the daily dressing of these wounds if secondary infection is to be prevented. If the patient has good resistance against tuberculosis, the wound and sinuses will heal promptly from below upward.

#### THE TREATMENT OF BILATERAL LESIONS OF RENAL TUBERCULOSIS

As mentioned previously in this paper, we find clinically that 65 per cent of the early lesions of renal tuberculosis are bilateral. Patients may have a macroscopic destructive lesion in one kidney and a non-or slightly destructive lesion in the other. These kidneys should be re-examined repeatedly and frequent urinalyses and pyelograms should be made to estimate the progress of the macroscopic destructive lesions in one kidney, and to search the other for evidence of the development of macroscopic destructive lesions. We have watched a non-destructive lesion in one kidney apparently heal so that we were able subsequently to remove the other kidney containing the destructive lesion. We have observed some patients with bilateral infection develop enough defense mechanism during constitutional treatment so that the lesions in their kidneys did not progress and their bladder symptoms practically disappeared. A number of our bilateral group of patients have returned to work for several years. A patient with bilateral renal tuberculosis, in our opinion, is not a hopeless case. His span of life from the genitourinary standpoint is measured by the available functioning renal tissue present. He must remain under constitutional treatment in a sanatorium until a thorough defense mechanism is built up so that lesions in his kidneys and any extraurinary activity may be controlled. Bilateral renal tuberculosis is usually not a surgical condition. Almost every tuberculous kidney contains some good tissue so that two tuberculous kidneys contain more reserve tissue than one. Occasionally, nephrectomy may be justified when a patient with bilateral destructive lesions has severe pain, hemorrhage, or obstruction of the ureter.

#### SURGICAL TREATMENT FOR TUBERCULOSIS OF THE LOWER URINARY TRACT

Tuberculosis in the scrotum is usually an infection in the epididymis and vas deferens and not in the testicle. Seventy-five per cent became bilateral. In only an occasional instance are we unable to find clinical evidence of tuberculosis in the prostate with infection in the epididymis. During the past five years, we have been interested in the association of lesions of tuberculosis of the lower urinary tract and the kidney. In

only one patient of the last thirty-five were we unable to demonstrate the presence of a lesion in the kidney when tuberculosis of the epididymis was present. This occurred in a man who was discharged from the sanatorium as an arrested case before we were able to completely re-examine him. Wm. M. Spitzer<sup>5</sup> in a recent article states that tuberculosis of the genital tract is probably due in the majority of cases to extension from the upper urinary tract.

Tuberculosis of the epididymis may be a very acute condition, progressing frequently to abscess formation. These abscesses may be aspirated, or drained externally so that the acute process will subside, after which an epididymectomy may be done. Many patients who have had epididymal abscesses drained, plus heliotherapy and constitutional treatment have recovered completely. When operative treatment is indicated, epididymectomy should be done and not castration. The epididymis, together with the vas up to the internal ring, may be carefully resected without destroying the blood supply to the testicle, or the testicle itself.

We have noted during our complete urological examinations and in our autopsy material that tuberculosis of the prostate progresses to abscess formation frequently. These abscesses drain into the urethra and may be the cause of producing pus or tubercle bacilli in the terminal urine. With the cystoscope large dilated infected prostatic ducts and abscess cavities may be seen. Associated with abscess of the prostate we have encountered extensive ulceration of the bladder out of proportion to the renal lesions present.

#### CONSTITUTIONAL TREATMENT OF UROGENITAL TUBERCULOSIS

The constitutional treatment of tuberculosis, *i.e.*, rest and heliotherapy, should be given both before and after surgical treatment. This enables the patient to arrest any residual infection by keeping up his resistance. In the sanatorium, any patient who submits to any type of surgical treatment is required to remain in bed, at rest, with heliotherapy when possible, from one to six months following operation. This is a good rule for patients who are not residents of a sanatorium, but it may be varied according to the patient's manifested resistance, his temperature, and general condition after the operation. Every



patient with urogenital tuberculosis should know that he is suffering from a general disease, and that the removal of his kidney alone may not cure him. He should be told that the cure of tuberculosis is achieved only by the patient himself, and requires time and patience. In the management of urogenital tuberculosis, treatment should be directed at the patient as a whole, not the local lesion alone. Bed rest and heliotherapy after operation applies particularly to the patient who has remaining lesions of, tuberculosis, such as cystitis. We have observed many patients with very severe tuberculous infections of the bladder return to normal during careful hygienic treatment.

#### CONCLUSIONS

1. The successful surgical treatment of urogenital tuberculosis depends primarily upon an accurate diagnosis. This may be accomplished only after repeated complete urological examinations.

2. Surgical treatment for any type of tuberculosis, except in an emergency, should not be undertaken until the patient has developed a sufficient defense mechanism.

3. The surgical treatment of urogenital tuberculosis is rarely an emergency.

4. Surgical or medical treatment of tuberculosis should aim at the patient as a whole, not alone at the local lesion.

5. Renal tuberculosis or other urogenital lesions are local manifestations of a constitutional disease.

6. Non-destructive renal tuberculosis, unilateral or bilateral, is a non-surgical condition and should be treated intensively by medical methods.

7. Tubercle bacilli in one specimen of urine obtained from the kidney pelvis is not in itself an indication for nephrectomy.

8. Unilateral slightly destructive tuberculosis should be treated conservatively under careful observation. Nephrectomy is indicated only when progressive disease is present.

9. Extensive unilateral destructive lesions should be treated by surgical methods.

10. Bilateral destructive renal tuberculosis is not a surgical condition except to stop hemorrhage or to relieve pain and sepsis, the result of an obstructed ureter.

11. This condition is not always a hopeless one as ordinarily considered. Under careful

medical management it may be compatible with life and useful work for a number of years.

12. Genital tuberculosis is usually an infection of the prostate and epididymis and in a high percentage of patients is associated with a renal lesion.

13. Tuberculous abscesses of the prostate occurs frequently. They drain into the posterior urethra and may produce pus and tubercle bacilli in the urine.

14. Tuberculosis of the epididymis is often an acute disease and may be cured by drainage and heliotherapy. When an operation is necessary it should be epididymectomy and not orchidectomy.

15. Surgical treatment of tuberculosis does not cure the disease but is merely a mechanical aid in producing a clinical result.

16. Constitutional treatment of urogenital tuberculosis is important and should supplement the surgical treatment, both before and after operation.

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## CERVICAL RIBS AND ABNORMAL FIRST THORACIC RIBS\*

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A SUPERNUMERARY cervical rib is formed by the overdevelopment of the anterior root of the transverse process of the seventh cervical vertebra (Bickham). Todd<sup>7</sup> states that cervical ribs are apparently normally present in the embryo but are present after birth as only transverse processes. Jones<sup>4</sup> especially contends that variations in formation of the brachial plexus are important factors while Todd holds that the blood vessels in the cervico-thoracic region are of equal importance in this condition. Although congenital, these deformities seldom cause trouble until adult life. Keen<sup>5</sup> says this is due to the fact that as we grow old the tone of our muscles is somewhat lost, which allows the shoulders to droop, and this increases the angulation of the plexus and vessels passing over the ribs. Some have stated that this anomaly is usually associated with some other, but this observation has not been generally confirmed. Henderson<sup>3</sup> states that *embryologically* each cervical vertebra has a costal process which unites with the transverse process to form the costo-transverse foramen. The cervical rib arises as a result of the overdevelopment of this costal process and in the dorsal region this forms the normal rib.

Brickner and Milch,<sup>8</sup> in 1925, reviewed the literature and reported two cases. They give Keen the credit for having recognized and described this unusual condition and having reported two cases in both of which cervical rib was diagnosed, but later proved absent. Neither case was operated upon. They illustrate the type where the first thoracic rib on one side is located at a somewhat higher level than its corresponding mate. Others (Lane, Helen, and Lebanco) have reported rudimentary or joined first ribs. Murphy, Bramwell, and Brichner have reported symptoms from apparently normal first ribs. Various theories have been advanced for the peculiarities in the development of the first rib but none have been proven. Wood Jones seems to have shown that rudimentary ribs occur when the second dor-

sal nerve takes part in forming the brachial plexus.

J. B. Murphy,<sup>6</sup> in 1906, stressed the point that the plexus and artery always passed behind the anterior scalenus muscle and that symptoms might be caused by compression between the muscle and rib. Also that acute angulation of the vessel over the rib may be a factor in producing vascular symptoms.

Todd feels that developmental influences are vital factors, and states that the axis of growth in the arm is at the level of the seventh cervical, and that the eighth cervical and first dorsal nerves course upward and over the ribs downward. Excess tension, angulation or stretching of these nerves over a normal or abnormally high rib or tumor of the rib would produce symptoms simulating those of a cervical rib.

Adson does not agree fully with Todd when the latter attributes the vascular symptoms to trophic disturbance caused by paralysis of the sympathetic fibers passing to the vessel and the skin. Adson is of the opinion that insufficient emphasis has been placed on the influence of the scalenus muscle which produces the compression of the artery and nerves against the cervical rib, or to abnormalities of the first rib. He has observed at operation that the muscle has a wide tendinous insertion which narrowed the space for the vessel and nerves.

*Anatomy.*—Supernumerary ribs are bilateral in 75 per cent of cases and are more frequently encountered in women. Many do not cause any symptoms and are often found accidentally in routine chest X-rays. It has been estimated that only 10 per cent require surgical interference. According to Adson, the credit for the first description of a cervical rib in detail belongs to Galen and Vesalius.

The size of the rib varies from just a rudimentary bud to that of a complete rib which resembles the first thoracic and unites with it anteriorly by means of a true cartilaginous attachment. The complete rib curves out laterally and then passes forward and downward between the

\*From the Division of Surgery, the St. Paul Clinic. Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 24, 1932.

anterior and middle scaleni muscles and attaches to the cartilage of the thoracic rib. The brachial plexus and the subclavian artery pass over it. The anterior scalenus muscle passes down in front of the artery and may attach by some fibers to the cervical rib but its main normal attachment

motor weakness, disturbance in sensation and circulatory abnormalities.

Pain may be noticed along the course of any of the branches of the brachial plexus, but in our cases, branches from the lower trunks of the plexus have been most frequently involved. The

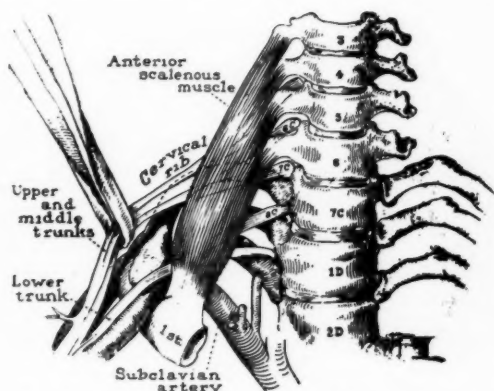


Fig. 1. Anatomical relationships. (Taken from Adson's article.)

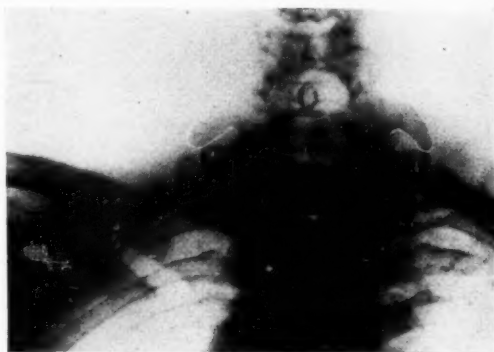


Fig. 2. Bilateral cervical rib. Rudimentary type.

is to the first thoracic rib. The phrenic nerve lies on the anterior surface of the anterior scalenus muscle. In addition to these important anatomical landmarks, the carotid sheath and others of less importance are crowded into a comparatively small space. The pleura is attached to the under surface of the extra rib and therefore the thoracic cavity is higher on that side.

In 1861, Coate performed the first operation with success and the operation had been repeated seven times by 1895. Keen collected forty-two operative cases with removal of the rib up to 1906.

**Symptoms.**—Patients are frequently seen who have run the gauntlet of therapeutic measures for so-called rheumatism, myositis, and neuritis of the arm, and have received no relief. A careful inquiry into the history reveals that other symptoms are also present, but are not so prominent or noticeable as the pain. Occasionally weakness, disturbance in sensation, changes in pulse and blood pressure, discoloration and even atrophy may be present, and I am sure that in many cases in the past, X-rays should have been taken.

Adson states that the important and characteristic symptoms of cervical rib are one or more of the following: pain, hyperesthesia, atrophy,

pain varies in quality and intensity according to the degree of pressure that is exerted by the extraneous rib. Pain is most frequently noticed during the latter part of the day, or after continuous or heavy work involving use of the arms in such a way that they are stretched or pulled downward, as in lifting. Twisting motion may bring it on forcibly as exemplified in one of my patients.

Disturbances in sensation from hyperesthesia to anesthesia may occur. In fact, one case presented hyperesthesia comparable to "trigger zones" in trifacial neuralgia, touching certain areas on his middle or ring finger causing exquisite pain to shoot up the arm. Burning, tingling, and numbness are often associated and patients will tell you how they have to "rub their hands and fingers to get the life back into them."

An interesting test is to have the patient raise the arm, stretching it straight above the head. This should give relief from pain as it temporarily reduces the angulation of and pressure on the nerves and vessels over the extra rib or over an elevation or tumor of the first rib.

Hyperextension of the head or neck to the opposite side may increase pain and may also obliterate the pulse on the affected side. Atrophy is rare and quite variable in degree. Its extent depends primarily on how large the extra rib is

and just how far down on the first dorsal rib the cervical rib attaches. Usually the larger ones come in contact with more roots of the plexuses and put them on greater stretch, causing correspondingly greater involvement. For many years it has been noted that the scalenus anticus muscle

3. Cases with definite symptoms directly attributable to cervical rib:

- a. Brachial pain with sensory or circulatory disturbance sufficient to incapacitate the patient.
- b. Atrophy of the hand and arm on the affected side.

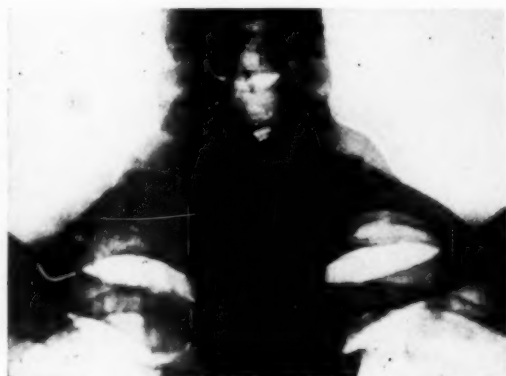


Fig. 3. Bilateral cervical rib attaching to the middle of the first thoracic rib.

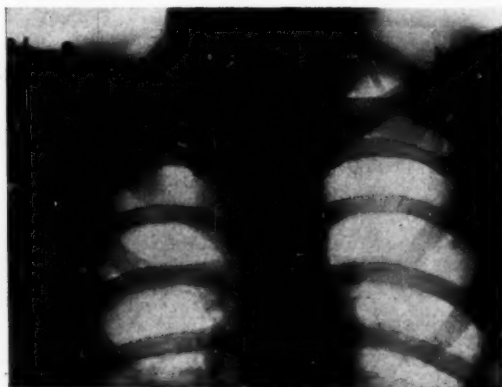


Fig. 4. Bilateral cervical rib with marked projection downward on left side.

by its direction and attachment provides a smaller groove for the artery and plexus in the presence of a cervical rib. Some have gone so far as to state that gangrene may result from pressure of the muscle on the artery. Others have claimed that the ischemia and gangrene of the finger tips is due to pressure on the sympathetic fibers which supply the vessels themselves, causing spasm and constriction, and limitation of the blood supply.

A recent article by Funston calls attention to deformities of the hand and wrist—as club hand—in infants as a result of cervical ribs.

In general, cases should be divided into three groups, depending on the symptoms:

1. Neurotic patients with indefinite pain in the distribution of the brachial plexus without circulatory disturbance. Surgical interference should be cautiously advised in this group. Very frequently in these patients pain is attributed to anomalous conditions and is not relieved by surgical treatment.

2. Those in whom symptoms are produced by anomalies in the supraclavicular triangle similar to those produced by the cervical rib and the scalenus anticus muscle, such as a high placed or tumor of the first thoracic rib. With this group of symptoms, exploration should be carried out.

- c. Circulatory disturbance on the affected side sufficient to be demonstrated by an alteration or obliteration of the pulse on extending the neck or rotating the head but not producing pain or atrophy.

In the third group, surgery is advisable. The circulatory disturbance may be slight and produce nothing more than a dusky appearance of the skin, or it may be sufficiently severe to produce thrombosis of the radial or ulnar artery, or both, with gangrene of the finger tips. Since the scalenus anticus muscle in the presence of a cervical rib is capable of compressing and traumatizing the subclavian artery to the extent of producing thrombosis, surgical treatment should be urged when the circulation is disturbed on the affected side even if nervous symptoms are mild or absent.

There is a case reported in which spasm of the diaphragm was relieved by removal of the cervical rib. The phrenic nerve lay on the anterior surface of the scalenus anticus muscle and was impinged by the rib. According to Adson and Coffey, circulatory symptoms were present in seventeen of 303 cases.

Atrophy may in part be due to disuse, as these patients generally restrict the use of the painful



arm. There may be sweating on one side of the arm and dryness on the other, a difference in pulses, blood pressure, and color of the skin (pallor or at times cyanosis). A mass may be felt in the supraclavicular triangle in thin people. Tenderness on pressure was present in our cases

Three methods of approach have been described:

1. Lateral route of Thorburn;
2. Posterior route;

These methods have for their object, the removal of at least a portion of the extra rib. Adson,

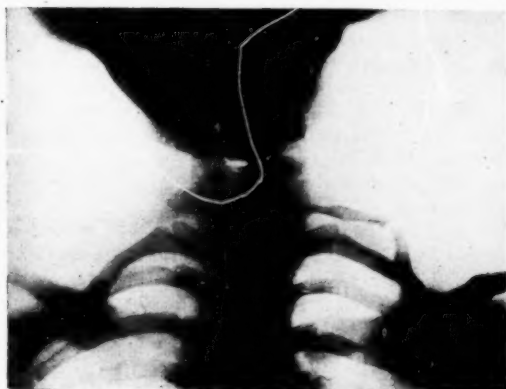


Fig. 5. Bilateral cervical ribs with fracture of the one on the left side.



Fig. 6. Margin of first thoracic rib, simulating symptoms of cervical rib.

although it is not usually described.

While cervical ribs are not uncommon, anomalies of the first thoracic ribs causing symptoms are not of such rarity that attention should not also be called to them. As previously stated, they may produce a train of symptoms very similar to cervical ribs, and should be considered in making a differential diagnosis of the course of nerve and vascular symptoms in the upper extremities. It is an interesting fact that symptoms do not become apparent until the patients have at least reached middle age. At this time, there may occur a change in the position of the shoulders and they slant more downwards, making a different angulation for the plexus and vessels as they ride over the ribs.

**Differential Diagnosis.**—Even though an enlargement of the first thoracic or cervical rib may be present before operative interference is advised, we must rule out such conditions as myelitis, anterior poliomyelitis, progressive muscular atrophy (Aran Duchenne type), syringomyelia, and peripheral neuritis. A careful history and neurological examination will definitely rule out these conditions.

**Treatment.**—Operative treatment is the only means of securing permanent relief.

however, has definitely shown that this is unnecessary, and he advises

3. The anterior approach.

This is the technic I use. A transverse incision is made in the supraclavicular space, the anterior scalenus muscle identified, and the brachial plexus exposed. It may be impossible at this point to identify the artery from the plexus, if pulsation is not present. By careful dissection, the plexus can be separated from the artery, and the compression of the artery by the anterior scalenus muscle in front and the rib behind can be easily seen. The phrenic nerve can be identified lying on the anterior surface of the anterior scalenus muscle. It is retracted medially and the plexus gently retracted outward. The anterior scalenus muscle can then be cut transversely at a level just above the artery. The muscle will immediately retract and the artery can be seen to pulsate again. The wound is closed without drainage. Both immediate and late results are much better following this simpler operation.

Two cases, illustrating changes in the first thoracic rib, producing symptoms simulating cervical rib, are of sufficient interest to warrant a more detailed report.

## CASE REPORTS

**Case 1.**—F. M., a widower, aged thirty-five, gave a negative family history. He had never had any serious illness, operations or accidents. Two months previous to examination, while turning down some grease cups on some farm machinery, he thought he strained the muscles of his left arm and hand, but did not pay much attention to it at the time. A couple of days later, his hand began to tingle and itch as though he had chilblains. A little later, his left hand began to get cold more easily than his right, and he had to wear two mittens on it. The ends of his fingers felt dead at times. This was about three weeks after the supposed injury. Then he noticed a loss of strength in the left arm and the grip was poorer. These symptoms gradually became worse and he noticed definite muscle weakness in the left hand.

Two weeks previous to examination, he was driving his car when he noticed that his left hand suddenly turned white and became ashen and there was severe pain in the middle finger. He was obliged to stop driving. This condition lasted one hour, and by massage he was able to bring back the color and feeling in his hand. Later, pain in the hand and especially the middle finger increased. Unable to sleep at night, he had to get up and walk the floor, rubbing his hand and fingers. Heat aggravated the pain. Pulling on the fingers seemed to relieve the pain. Certain areas became extremely hypersensitive. A week previous to examination, the home doctor made an incision into the tip of the middle finger, which was discolored and tender, in an attempt to relieve the pain. This did not help and the tip of the finger became black and hard.

Examination proved negative except for the left arm and neck region. There was a marked difference in the comparative muscle strength of both arms. His left hand was cold, weak and quite useless. His hand became pale when he tried to grasp an object. There was some atrophy of the interossei and muscles of the forearm. The finger tips were hypersensitive and a small area of gangrene was present at the tip of the middle finger, where it had been incised. The radial and ulnar pulse were gone. Blanching of the skin and back of the hand on pressure remained for some time after the pressure was removed. Only a faint suggestion of a pulse could be felt in the region of the brachial artery. The left supraclavicular space was somewhat fuller than the right but no definite mass could be palpated. A bruit could be heard above the left clavicle, a humming sound as over an aneurysm.

The blood Wassermann was negative; hemoglobin 88 per cent; B. P. 144/80, both right and left. The stereoscopic X-ray of the chest was negative *except for an enlargement of the middle anterior portion of the first rib on the left side which appeared to be an osteoma.*

**Diagnosis.**—Operation was undertaken to relieve pressure on the left subclavian artery and brachial plexus especially the eighth cervical and first dorsal nerves. The technic followed was according to Adson's method of cutting the anterior scalenus muscle. The patient made a very excellent recovery in every respect.

**Case 2.**—A male, aged thirty-three, gave a family and past history which were essentially negative.

About two years previous, he had noticed at times a numbness and tingling in the second finger of his right hand. He did not pay much attention to this at first, but a little later on it became more pronounced, and he would have pain extending to the elbow. He noticed that this pain became worse when he did some heavy lifting. At times it would extend up to the shoulder region. The skin on the palmar surface of the second finger became very thick and had a tendency to crack. At times the first two fingers became very numb and he had to rub them to obtain relief. He noticed that at night he had to lie on his left side and place his right arm on the pillow, rotated outward in order to sleep. He had tried various salves and massage, but nothing seemed to give him relief.

The general examination was negative except for the first two fingers of his right hand, which showed a trophic disturbance with a thickening, peeling and cracking of the skin. The tips of these fingers were very hypersensitive. He stated that at times small blisters had appeared.

The urine, blood Wassermann, and blood pressure were negative.

X-rays of his chest and arm were negative except in the right supraclavicular area. The first rib on the right flared out much more than that on the left. This caused the plexus and vessels to be stretched and pulled at a different angle over the first rib. This would tend to increase the pressure by the anterior scalenus muscle and we felt that operation should be done in this case.

In the meantime, the patient is not using that hand for any lifting, and is feeling more comfortable. However, the trophic disturbances are still present.

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## MYOSARCOMA OF THE RECTUM\*

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**M**YOSARCOMA of the rectum is no doubt a rare lesion and from this standpoint it does not seem important, yet because of the type of treatment advisable for these lesions, it appears justifiable to present the following cases.

Many types of sarcoma of the rectum have been described from time to time, depending on the predominant type of cell found in the neoplasm. Among them are lymphosarcoma, melanosarcoma, fibrosarcoma and spindle cell sarcoma, and in each of these groups a fairly large number of cases has been reported so that sarcoma of the rectum as a general group is not an unusually rare lesion. However, if myosarcoma is considered in a group by itself, only four undoubted cases could be found in the literature. Exner, in 1908, described two cases; one of the patients was a man aged forty-nine years and another a woman aged fifty-one years. Lapeyre in 1920, reported a series of thirty cases of primary sarcoma of the rectum, two of which were myosarcoma. Of the four cases reported in this paper, two were reported by Thompson in abstract form in 1927.

### REPORT OF CASES

*Case 1.*—A farmer, aged sixty-two years, first came to the clinic in 1911, at which time a hard fixed mass about 5 cm. in diameter was found in the left side of the rectum near the anus. Symptoms except mild constipation were not referable to this mass. He refused treatment and was not seen again until December, 1916. During this interval constipation had increased, and he was beginning to notice a constant sense of fullness in the rectum. He had been having increasing difficulty in voiding urine, and three weeks before admission an attack of acute retention had required catheterization of the bladder.

On examination a large, rounded mass about 12 cm. in diameter was located in the area described, extending from the sphincter of the anus to the vesical neck. In January, 1917, through the perineal route, a soft friable tumor weighing 330 gm. was enucleated without great technical difficulty. Convalescence was uneventful and the patient had no further trouble until a year later when his previous symptoms returned. A large recurrent mass was found at the site of the former operation. This was excised and the wound was left open for radium treatment. For the next eleven

months 2,700 milligram hours of radium were given in five treatments, but the tumor continued to recur and at the last examination, in January, 1919, the patient was having considerable difficulty in getting his bowels to move. He has not been heard from since. Pathologists reported the tumor to be a fibromyosarcoma (Fig. 1).

*Case 2.*—A man, aged fifty-nine years, came to the clinic November 3, 1919, complaining of having had difficulty in moving his bowels for six or seven months. There had also been some frequency of urination for the last month or two.

General examination was negative except for a large rounded mass 5 cm. in diameter on the posterior wall of the rectum about 2 cm. above the internal anal sphincter. The mucosa was not ulcerated and cystoscopic examination did not reveal abnormalities. November 18, 1919, the tumor was removed through a posterior incision. Microscopic examination of the lesion disclosed myosarcoma.

The patient had no further symptoms until November, 1923, when he returned to the clinic because of protrusion of a small piece of tissue from the anus. A recurrent mass fixed posteriorly and breaking into the rectal mucosa was found. Wide excision of the mass was done and after an uneventful convalescence the patient was free of symptoms until December, 1924, when further recurrence was noted. The mass was again excised and radiotherapy was carried out over a period of four weeks. The patient died about a year later, after wide extension of the growth (Figs. 2 and 3).

*Case 3.*—A man, aged sixty-four years, entered the clinic March 30, 1921, with complaints of frequent and difficult urination for three months, and of one attack of acute retention requiring catheterization. Constipation was increasing and bowel movements had been noticeably smaller in caliber for the last five years. He also had occasional sharp shooting pains in the rectum.

A large, smooth partly fixed tumor filling the pelvis was found. Through the proctoscope this did not appear to involve the rectal mucosa, although it was attached to it. The tumor, weighing 354 gm., was removed April 11, 1921, through an anterior incision and radium was placed in the area. Further radiotherapy was given during convalescence. After temporary improvement the tumor apparently recurred at site of removal, and the patient died March 4, 1922. The pathologic diagnosis was myosarcoma (Fig. 4).

*Case 4.*—A man, aged fifty-one years, had been examined at the clinic in 1921 with essentially negative results. He returned in April, 1931, complaining of a slow growing lump just within the anus which had first been noticed shortly after his visit in 1921. In 1929 the lesion had reached a diameter of 5 or 6 cm.

\*From the Division of Surgery, The Mayo Clinic.

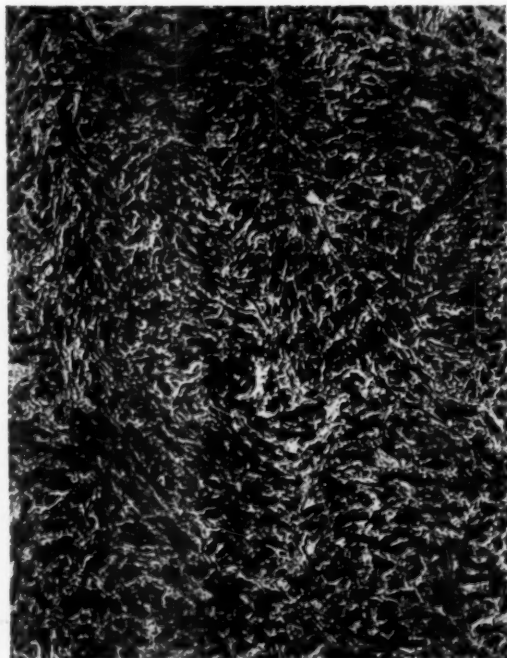


Fig. 1 (Case 1). Myosarcoma of rectum. Original tumor removed January, 1917; moderately cellular although myomatous and fibrous elements predominate. Sarcoma of grade 1 according to Broders' classification.

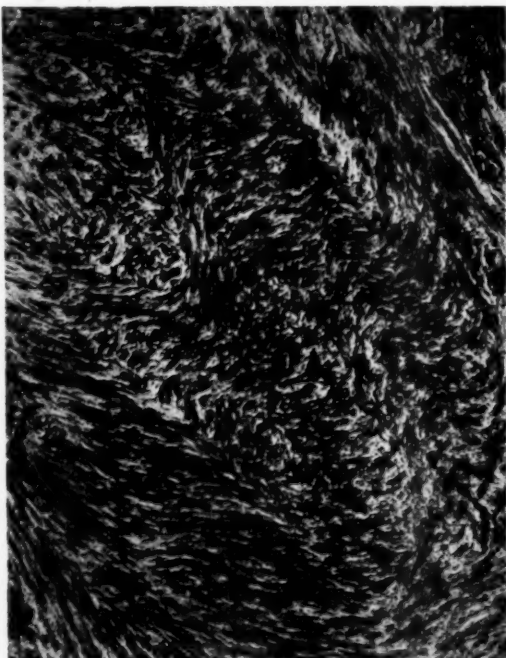


Fig. 2 (Case 2). Primary lesion removed November, 1919. Rather cellular fibromatous and myomatous structure.



Fig. 3 (Case 2). Recurrent tumor. Increased number of cells with higher degree of malignancy. Sarcoma of grade 1.

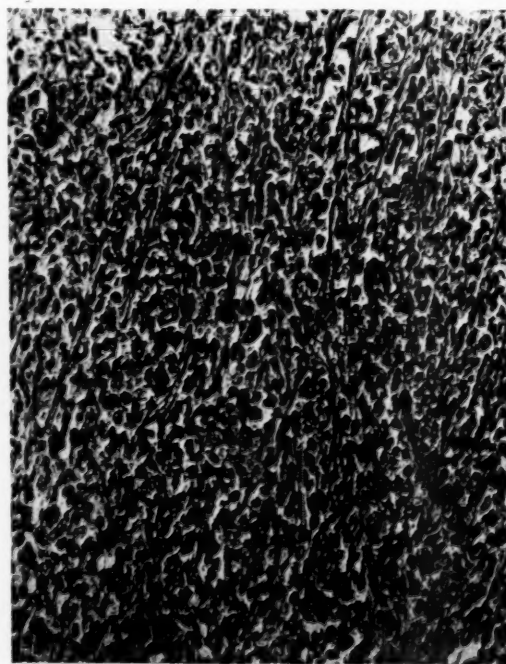


Fig. 4 (Case 3). Undifferentiated type of cell. Clinically, the course was rapid, and there was early extension of the malignancy. Sarcoma of grade 3.



and was excised locally by the patient's home surgeon. This mass had recurred and in April, 1931, was again excised. The pathologic diagnosis was myosarcoma. On his return to the clinic in January, 1932, another recurrence had taken place. This had not caused symptoms except occasional pain locally, especially after he had been sitting for a long time.

Examination disclosed one mass anteriorly just above the dentate margin of the anus, and a larger one to the left of this area about 3 cm. in diameter. On account of the marked tendency of the tumor to recur a radical operation was decided on. February 26, 1932, 45 cm. of the rectum and sigmoid were removed by a combined abdominoperineal type of resection. Metastasis was not found within the abdomen or about the growth. Convalescence was normal and the patient was dismissed the twenty-ninth day after operation in excellent condition (Fig. 5).

The unusual and important points demonstrated by these four cases are that the symptoms caused by the lesions were unusual in comparison with the common lesions of the bowel; their tendency to lie under the mucous membrane and ulcerate late makes it rather difficult to arrive at an accurate diagnosis without a microscopic section. The second important observation is the rapid and uniform recurrence with failure to respond to irradiation. The bad prognosis indicated by this small series of cases in which local excision and irradiation was done unsuccessfully would seem to indicate the desirability of radical operations on the recognition of the type of lesion with which one is dealing, that is, if the diagnosis is obscure.

#### SUMMARY

The characteristics of myosarcoma of the rectum may be summed up as follows: 1. The lesion occurs most frequently among men in the fifth and sixth decades; only one case of a woman was found recorded in the literature. 2. The tumor is slow growing with late metastasis but with marked tendency to local recurrence. 3. The tumor occurs as a rounded circumscribed mass lying close to the internal anal sphincter and originating in the muscular tissues; later it breaks through into the rectal mucosa and then externally to the perianal tissues. 4. After involvement of the mucous membrane the lesion somewhat resembles carcinoma, but the two can usually be distinguished by careful examination. A myosarcomatous tumor possesses a broad indurated base resulting from considerable growth before the mucosa is reached. The lesion en-

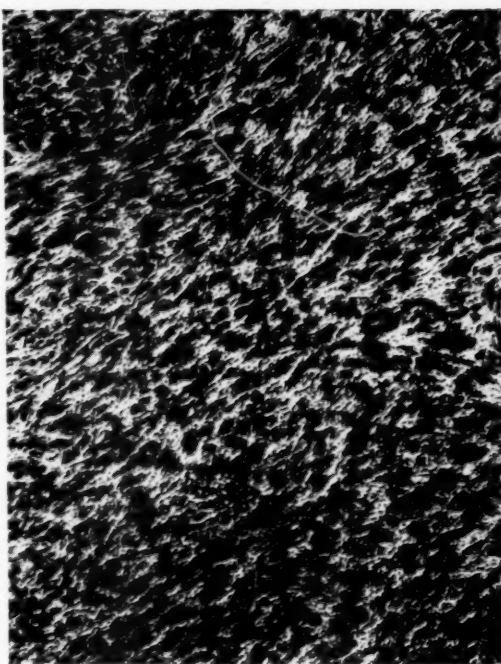


Fig. 5 (Case 4). Section from tumor removed February, 1932. Slow growth but marked tendency to recurrence. Sarcoma.

croaches on the lumen to a greater extent than does carcinoma, resulting in symptoms of obstruction before ulceration and bleeding occur.

5. Regional lymphatic involvement is apparently rare in cases of myosarcoma, but common in the case of carcinoma; death in the former takes place from direct extension to pelvic organs, to obstruction and to local recurrences, and when the blood stream is invaded to generalized sarcomatosis. 6. In the clinical differentiation the chief conditions to be considered are carcinoma, syphilis, tuberculosis, and polyps. The early involvement of the mucous membrane in carcinoma, resulting in ulceration, bleeding, infection and frequently cachexia, is contrasted to that of myosarcoma in which constipation, straining and urinary difficulties are the first symptoms. 7. Myosarcoma exhibits a marked tendency to local recurrence after excision. This is evidenced in each of the four reported cases, and it would seem that radical treatment by wide excision locally is warranted. Furthermore, it seems very unlikely that much benefit can be derived from radiotherapy even in large doses so that resection is, no doubt, the treatment of choice.

## ACUTE INTESTINAL OBSTRUCTION\*

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*Duluth*

**I**N any study of intestinal obstruction the mortality rate is still found to be very high. In fact, it is much higher than in any other condition within the abdomen which demands surgical treatment. In the statistical studies which I have examined I have found that where one hundred or more cases have been taken into consideration the mortality rate ranges between 15 and 65 per cent.

The present study is based upon 128 surgical cases treated at the hospitals of Duluth during the past ten years. It includes only cases of complete obstruction in which the diagnosis was established at operation or at autopsy. It does not include cases of postoperative ileus, but only those of a mechanical nature. In this series of 128 cases there were forty-three deaths, a mortality percentage of 33.66. This is very much lower than in many of the studies above mentioned, but it shows a high rate of mortality when compared to other acute abdominal conditions.

Surgery cannot be blamed for this high mortality rate, for a mechanical obstruction can be cured only by surgical treatment. Some studies have reported a mortality rate of 70 per cent when medical treatment was used. The consensus of opinion among medical men is to the effect that a spontaneous rectification of a mechanical obstruction is very rare indeed and may well be called a curiosity. It is assuredly not due to sound scientific treatment. The reason for a high mortality rate in surgically treated cases is due to the delay arising between the event of the obstruction and the time of the operation.

The pathology is not always the same and in some cases death may come precipitately, evidently due only to shock. While a young student my attention was first called to this phenomenon in a very dramatic way. A man of approximately seventy years of age was seen at the dispensary and during the general examina-

tion the truss that he was wearing was removed. Immediately he complained of a severe pain which was caused by an acute obstruction in an inguinal hernia, and he died before he could be prepared for an operation.

Shock is always a conspicuous feature in some types of intestinal obstruction; it is present to some degree in all cases of strangulation obstruction and depends entirely upon the amount and the degree of occlusion of the blood supply to the affected bowel. In the late stage, shock is due to toxins in the circulating blood, to marked distention of the intestinal coils above the site of the obstruction, to dehydration, and to anoxemia.

Neither patients nor animals used experimentally will die within a definite and fixed time after the event of an intestinal obstruction, because the pathological process that is present is always the determining factor. The higher the obstruction, the more precipitous is the approach of death. A simple obstruction does not bring fatal results as rapidly as does a strangulation obstruction. A short loop obstruction terminates fatally more rapidly than does a long loop. This has been conclusively proven by Maury. Other factors such as the age of the patient, whether or not infection is present and the general physical condition of the patient are all very important. The time that has elapsed between the onset of the symptoms and the surgical treatment is the key to the prognosis of every case. Each hour of procrastination adds materially to the rate of mortality. In all studies the statistics given show a mortality of 50 per cent or more in cases where there has been a delay of fifty hours.

The surgeon is frequently not responsible for delay in the treatment of obstruction. Many of the patients in this series of cases were sick for many hours, and even days, before medical advice was sought. In the meantime the patient had taken cathartics and had been subjected to all sorts of concoctions and home cures. The internist, the general practitioner, and even the surgeon have often wasted hours and even days

\*From the Department of Surgery, the Duluth Clinic, Duluth. Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 25, 1932.

in trying to arrive at the proper diagnosis—resorting to exhaustive laboratory tests, the giving of enemata and even dosing the patient with cathartics. The assertion of C. H. Mayo that he has never observed a patient die because of an exploratory incision, but that he has often seen death occur because it was too late, should certainly always be in the foreground when one considers the diagnosis of an intestinal obstruction. An exploration should be undertaken whenever this condition cannot be excluded.

It is difficult to understand why we find in a study of a series of cases of intestinal obstruction, that there are almost always very definite evidences of many hours of delay, while in all other acute abdominal conditions early operations are the rule. An intestinal obstruction should always be considered as an emergency, because immediate surgery holds the only hope of a cure and the elimination of unnecessary mortality.

That there is an increasing mortality due to delay is shown in Table I.

TABLE I

Hours	Cases	Deaths	Mortality Percentage
1-8	26	2	7.7
8-18	35	7	20.0
18-36	11	3	27.2
36-48	20	6	30.0
Over 48	36	25	69.0

This reported mortality is similar to that given in other studies. H. W. Tuttle reported a rising mortality beginning with no deaths in thirteen cases that were treated within the first six hours. Thereafter the deaths increased rapidly up to 41 per cent. C. Jeff Miller found a mortality rate of 29.4 per cent in those cases treated during the first twelve hours and an increase to 84 per cent when the delay reached an upper limit of 96 hours. He states that he believes that in all cases where the delay exceeds 48 hours the rate of mortality will be over 50 per cent.

In my personal series, which consists of thirty cases with seven deaths, a mortality rate of 23.33 per cent, all were treated after a delay of over eighteen hours. This is an experience entirely too limited upon which to base any conclusion. However, it shows the definite tendency toward a lower incidence of mortality when treatment is promptly effected.

Our older textbooks usually stated that the

cause of obstruction was usually due to some type of hernia. We now find that some previous surgical operation of the abdomen accounts for the greatest incidence.

The causes of obstructions in this series are as follows:

Adhesions .....	49
Bands .....	14
Postoperative Hernia .....	4
Meckel's Diverticulum .....	7
Carcinoma .....	8
Mesenteric Thrombosis .....	1
Volvulus .....	3
Congenital Hernia .....	28
Intussusception .....	14

In a majority of the cases in which the obstruction was due to either adhesions or to bands there was a history of a previous abdominal operation.

Many theories are given to explain the cause of death in acute intestinal obstruction, but so far the exact cause is not definitely known. On this subject the best review is given by Cooper. He states that certain factors are known, but that very much is yet unknown. There is need for extended investigation because much confusion has resulted from the experimental work that has been done up to this time.

The early work of Hartwell and Hoguet, in which they made the discovery that dogs with obstruction will live longer when given intravenous saline than when not so treated, was the first to throw light on the subject. That loss of chlorides was one of the most important causes of death in high obstruction was first pointed out by Hayden and Orr. Their ideas on its exact effect have changed, but they and many others have absolutely proven that loss of chlorides is a very important factor in all cases of high intestinal obstruction. Whether or not toxemia exists in simple high obstruction is not certain, but if present it certainly is of minor importance.

In intestinal obstruction with strangulation there are many other factors, such as the presence of the high intestinal secretions, the formation of toxins, the amount of toxins, the presence of dead tissue, the absorption of substances through the bloodless dead bowel, the length of loop of bowel involved and many others. Time will not permit a discussion of them all.

That the presence of high intestinal secretions is a factor has been discussed by many authors: Maury, Benedict, Brockman, White, and others.

The presence of toxins has been definitely proved, but the cause of their formation is still a mooted question. Wangensteen states that normal intestinal contents are as toxic as those of obstructed loops and that toxicity is probably due to autolysis of tissue *in vivo*.

That absorption from the strangulated bloodless bowel occurs is very definitely proven, but certainly it cannot be very rapid, for both man and experimental animals often die more rapidly after the release of the obstruction. This is due to the rapid absorption of toxins liberated into the normal bowel below the point of obstruction.

That a short loop obstruction is more rapidly fatal than a long loop obstruction is a common clinical observation, but *why* we do not know. Brooks, Maury, and others have proven conclusively that in animals the above observation is an absolute fact.

Many other factors must be considered in analyzing the cause of death, such as shock, infection, especially by the bacillus *Welchii*. In high obstruction the cause of death is not the same as in low obstruction, but in all cases the cause of death probably in some way is related to the secretion of the pancreas and bile.

The diagnosis of intestinal obstruction should not be based on the descriptions which are given in old textbooks on surgery, for if we wait for those to appear our patient is usually beyond hope. A careful history, with short observation plus painstaking examination of the abdomen which must include auscultation, percussion, palpation and X-ray examination, will give us all the evidence we need in arriving at a proper diagnosis.

I put history first, for here as in any other disease it is the most important means of diagnosis. The history of sudden, crampy, intermittent abdominal pain is always significant and very characteristic, especially if not relieved by vomiting or opiates. In the elucidation of the history very many factors should be painstakingly considered. The most important are: the question of a previous operation, whether or not infection was present at the time of the operation, the nature of the operation, whether the patient has ever had any infection in the pelvis or in any part of the abdomen, whether or not there has ever been any evidence of hernia, the character of the pain, the nature and amount of vomiting, and the question of stools.

Many patients will give histories suggestive of peritonitis, either recently or many years before. In this series there were a large number of patients that gave a history of either previous pelvic infection or appendicitis.

Auscultation of the abdomen is not used as often as it should be. The stethoscope alone is one of the most important instruments in the diagnosis of acute intestinal obstruction. Everyone should familiarize himself with the normal peristaltic sounds, for the stethoscopic findings in ileus, in mechanical intestinal obstruction and in peritonitis are all very characteristic in each case. Visible peristalsis, which is always present in chronic obstruction, is rarely seen in cases of acute obstruction. Loud sounds like water going over a waterfall are heard when mechanical obstruction is present. These sounds vary a great deal, depending largely on the proximity of the obstruction to the point where the stethoscope is placed on the abdomen. Very often the site of obstruction can be located by this means. These sounds are often very high-pitched when one nears the point of obstruction. Percussion reveals some tympany, but usually it is not marked. In palpation of the abdomen we usually find no point of tenderness, and this alone helps to exclude most other acute abdominal emergencies.

The X-ray evidence is very valuable in the diagnosis of bowel obstruction. Wangensteen has definitely pointed out that in X-rays, taken either in the erect or lateral position, "fluid mirrors" can be made out in which air is layered over the fluid.

When gas is present in the small bowel, it is definite evidence of obstruction but, to be sure, not always mechanical in nature.

Vomiting usually is present in high obstruction, but in low obstruction it may be entirely absent or only moderate in amount. Fecal vomiting is an absolute symptom, but should never be considered as an early sign. Therefore obstruction cannot be excluded if vomiting is not present.

Patients may pass gas or even have bowel evacuations in spite of the presence of complete obstruction.

Laboratory tests are absolutely of no value in the diagnosis of acute bowel obstruction. The findings that appear in blood and urine are all late signs. The patient's temperature, blood pressure and respiration may be entirely normal.



The patient may look and feel well except when he has intermittent cramps. We sometimes see very pronounced symptoms early. These, however, are due to strangulation obstruction and all the symptoms depend on the degree of strangulation of the flow of blood to the segment involved.

The treatment is always immediate surgical intervention. Never wait for absolute signs to determine the location or nature of the lesion, but always decide to do an exploratory procedure whenever obstruction cannot be excluded.

Preoperative care consists of giving fluids in the form of saline, either hypodermically or intravenously. That chlorides and water are essential to maintain the water balance and replace the chlorides lost either by vomiting or retention has been proven by a large number of workers. The mortality can be very markedly reduced, especially in all cases of high obstruction, by this one method alone. Complete stomach aspiration should always be done, and this can best be accomplished by passing a nasal or duodenal tube, which may be left in situ during the operation—to be used in the postoperative care. This precaution is very important for in this series of cases several patients died on the operating table due to drowning in their own secretions. A large amount of gas can also be evacuated in this manner.

Spinal anesthesia is an ideal anesthetic on account of the complete relaxation that it affords. However, certain rules which apply to all kinds of spinal anesthesia must be strictly observed. Especially should one remember never to use spinal anesthesia upon a patient in a moribund condition.

The incision should be placed in the midline, especially in cases where the site of obstruction is not known. At first the incision should be very small for it can easily be increased in length if found necessary.

The exact type of procedure to follow after the incision has been made depends on the condition found. In cases that are diagnosed early the obstruction is released. If the circulation returns to normal that will suffice. However, if some portions of the bowel appear to be slightly damaged, an enterostomy tube should be inserted. In cases where a large portion of the bowel is gangrenous, one must select the type of operation that is best suited to the individual patient. Some of them do best by first exterior-

izing the bowel and leaving the anastomosis to a later date. Early cases of strangulation, where the blood supply does not return, are perhaps best treated by resection and anastomosis, usually followed by enterostomy. If the patient's condition is critical and no segment of bowel is deprived of its blood supply, an enterostomy alone is the operation of choice. Later when the patient's condition warrants, the obstruction can be released. In certain cases this will never be necessary for the cause of the obstruction cures itself. Those cases due to recent plastic peritonitis should, if possible, have all the adhesions freed and one or more enterostomy tubes inserted. Short circuiting operations are very valuable in some cases. Cecostomy should be done in cases where malignancy is the cause of obstruction in the large bowel.

Following operation saline administered by intravenous injection or hypodermically should always be given except in very early cases. The intake and the output should be very carefully charted. In one case the combined output through a nasal tube and an enterostomy tube was nearly eight quarts in twenty-four hours. The fluid required to keep the water balance nearly normal should be about 4,000 c.c. in excess of the amount lost through vomiting or drainage through the duodenal or nasal tube and that lost through the enterostomy tube. Glucose in 10 per cent solution intravenously is the best method of administering food to these patients. In some cases a transfusion of blood is indicated. If a large quantity of fluid is lost through the nasal tube or a high enterostomy tube, a large portion of this fluid should be given in the form of proctoclysis. In cases where the bowel is exteriorized, the contents coming from the upper segment should be inserted into the lower segment to prevent the loss of secretions of bile, pancreatic fluid, etc.

Bile, according to Brockman and Benedict, given by proctoclysis is a very valuable adjunct in the treatment of these cases.

#### SUMMARY

1. The mortality of intestinal obstruction is still much too high.
2. An early diagnosis and an early surgical intervention will decrease the mortality.
3. A history of cramps with no localized tenderness or pain in the abdomen when air is

visualized in the small bowel by X-ray and characteristic sounds are heard by auscultation are all the findings that are necessary for the diagnosis of intestinal obstruction.

4. Laboratory tests are of no avail in early diagnosis.

5. An exploration should always be done where an obstruction cannot be excluded. Mortality may be reduced only by early observation and an immediate operation.

6. The choice of surgical procedure depends on the condition of the patient and the damage found at operation.

7. Preoperative and postoperative care are important.

8. Spinal anesthesia is the anesthetic of choice.

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### A CONSIDERATION OF THE UTILITY OF RADIUM IN THERAPEUTICS\*

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IT IS not my intention to recount the achievements of radium in medicine in a city which itself is an important radium center. The splendid radium treatment given here is a result of the efforts of my former chief, Howard A. Kelly, and his associate, Curtis F. Burnam, who are outstanding pioneers in the science of radiology.

Treatment of disease by radium and roentgen rays is now an established addition to modern medicine. Therapeutic radiology has passed through the early stages common to all new forms of treatment: overenthusiasm, disillusionment and discouragement, and finally recognition of limitations and success in smaller but well-defined fields. In short, therapeutic radiol-

ogy has passed from infancy to adolescence, and its possibilities and contraindications are more clearly demarcated. There is a definite scientific foundation for radium therapy; investigation of the physiology of normal and abnormal cells and their reaction to irradiation of short wavelength furnishes the basis for this.

Radium as a therapeutic agent is exceedingly costly. It is not likely to fall much below the present value of \$70,000 a gram, although this represents a reduction to almost half its price when it was first used medically. The reason for its cost is threefold: the scarcity of the element in nature, the enormous quantity of chemicals necessary in its extraction, and the length of time (measured in months) necessary to obtain the finished product from the crude ore.

\*From the Section on Therapeutic Radiology, The Mayo Clinic, Rochester, Minn. Read before the American Therapeutic Society, Baltimore, Maryland, May 16 and 17, 1932.

However, once purified radium is secured, the possessor has command of the most powerful and stable medicine known to science. It is an unequalled natural source of energy. The therapeutic rays are evolved from spontaneous disintegration of the radium atom and its decay products; hence this energy is given off at a constant rate which cannot be altered by chemical or physical means. The process of decay is slow compared to the lifetime of man. In twenty-five years only 1 per cent of radium will be lost through decay; half the radium now possessed will have disappeared in 1,690 years but the disintegration is so gradual that a substantial fraction of it will still be working and emitting rays at the same rate 100,000 years hence; to be exact, a sixty-fourth of the original purchase.

Radium becomes an ideal agent because of two characteristics: the energy liberated is constant and cannot be altered in any way, and methods of measuring the amount used are exact. The rays emitted are so powerful, and electrical instruments of mensuration so precise, that the radiations from less than one-millionth of a gram can be accurately measured.

Although radium is so scarce, less than 5 per cent of the rays emitted by the costly element are utilized. This seems very extravagant. However, the alpha and beta rays have been found too caustic for ordinary purposes of treatment, and of late years use has been made mainly of the gamma ray, which is so penetrating that a small percentage will pass through 15 cm. of lead. The physical factor of "penetration" must not be confused with the biologic effects of the rays. That gamma rays are tremendously penetrating does not imply that they are caustic or injurious in proper dosage; it is only the absorbed rays which act on the tissues, not the rays which pass on through. The gamma rays are on the average one hundred times as penetrating as beta rays, and the beta rays in turn are one hundred times as penetrating as alpha particles. The destructive or caustic effects are in reverse order: the alpha particles are more destructive than beta rays or gamma rays in the ratio of 10,000 to 100 to 1. The beta rays are screened out by metal filters, and the glass containers effectively stop the alpha rays.

To sum up, then, this agent is stable and evolves therapeutic rays at an unalterable rate. Consequently, if a physician reports all his fac-

tors in treatment, such as the amount of radium used, the size and shape of the applicator, the size and situation of the field treated, the duration of the treatment, the distance of the element from the part treated, and the metal filters employed, such treatment can be accurately duplicated at other places. Best of all there is no worry, as with other agents, as to whether the preparation is fresh and potent.

One more quality worthy of emphasis is that radium is extremely flexible, and can be used in a variety of ways. Roentgen rays are therapeutic rays of similar nature, although of longer wavelength; their mode of application is more fixed; roentgen tubes cannot be introduced into sinuses and cavities of the body. Radium can be used at a distance from the part treated, placed in cavities of the body, introduced as needles into the center of diseased tissue, or placed in sinuses and fistulas.

However, with an element producing such powerful rays constantly, over centuries of time, there is grave danger in introducing radium itself into the human body, through the alimentary tract or by hypodermic injection. The headlines in newspapers frequently record instances of "radium poisoning." The success of radium rays in treating a few types of malignant growth of certain organs became popularly appreciated; many commercial houses profit enormously by the sale of so-called radium waters, emanators, and activators for internal use. These products rarely contain any appreciable amount of radium; if they do, they seriously endanger life. Martland, in pathologic studies of painters of watch dials who ingested radium, demonstrated the fatal anemia engendered, and the radium osteitis and bone sarcomas which arise later to afflict patients who survive the first few years' ravages of the ingested radium. This is truly an important problem, when it is recollected that during 1926 more than 150,000 radium emanators were sold to the public on the Pacific coast alone, advertised to cure many ailments. These radium waters or emanators contain either the gas radon, known as radium emanation, which is the first decomposition product of radium, or else minute traces of a radium salt dissolved in water. In the first instance it is possible that no harm may result, for radon is very slightly soluble in water, and has a half-value period of only 3.85 days; most of it escapes as a gas be-

fore it is swallowed, and the remainder will shortly disintegrate. In the second instance, dissolved radium is introduced into the body, and readily destroys life, although possibly not until years have passed. A milligram of radium is about the size of a grain of sand; a microgram is one-thousandth of this and is invisible and chemically undetectable, but Martland has calculated that 10 micrograms of radium deposited in the body is sufficient to cause death. The soluble radium salts are converted into insoluble salts in the blood, and deposited throughout the skeleton. Martland calculated that the alpha particle, which comprises 92 per cent of the rays of radium, is the fatal agent. He has estimated that if 10 micrograms of radium were deposited in a skeleton in 1931, alpha particles would still be emitted from that skeleton in the year 3941, and that the number of such particles emitted each second in that year, would be 185,000. The beta and gamma rays emitted from this 10 micrograms are practically negligible in destructive effect; they together form only 8 per cent of the total rays. As stated before, alpha rays are never used in radium therapy, the glass container of the applicator effectively stopping them. In treatment, the rays employed are emitted by radium which is confined or inclosed in containers. The so-called poisoning results from release into the body of radium itself.

The same dangers apply to hypodermic injection of radioactive salts into the blood stream. This will inevitably produce death after a time, and is justifiable only in the occasional selected case of leukemia or Hodgkin's disease or other inevitably fatal malady, as a palliative procedure.

Treatment with radium, in the hands of physicians acquainted with the technic of administration, has achieved outstanding success in certain forms of malignant growth and in many benign disorders. The widespread use of radium in medicine in this country attests its effectiveness. At a recent national radiologic meeting, Dr. Sayers, of the United States Bureau of Mines, stated (if I cite him correctly) that there were about 84 gm. of radium in use medically in this country, concentrated in 250 hospitals, each of which possessed 75 mg. or more. There were only about seven states without radium for medical purposes.

Let me emphasize here that radium therapy is a highly specialized branch of medicine; the

radiologist must have a profound clinical knowledge of disease as well as a thorough command of the technical aspects of irradiation. He must also cooperate fully with internist, surgeon, and pathologist to attain the best results. Years of experience are necessary, and radium treatment can be most efficiently carried out in hospitals where an adequate supply of radium is available and the personnel is experienced in its use. The "mail order" method of radium treatment is not very satisfactory; many business institutions rent the expensive element to any physician, with written directions for its use; this usage is not more commendable than prescribing drugs by mail. Treatment with radium cannot be standardized according to diagnosis, but each patient constitutes an individual therapeutic problem. A great deal of harm may ensue from the ill-advised application of so powerful an agent; a curable condition may easily be converted into a painful, intractable lesion.

Since much of the record of research and advance in irradiation is issued in journals on radiology that are not always of interest to the internist, it may be worth while to recount some of the trends and changing ideas about treatment. Radium and roentgen rays are indicated in certain types of malignant growth. The rationale of the treatment is that immature, rapidly-growing cells succumb more quickly than normal cells, and with smaller doses, to irradiation of short wavelength; in fact, this is carried much farther, in that the specific sensitiveness of the cells of different tumors is recognized and aids in prognosis. For instance, carcinoma of the uterine cervix is peculiarly susceptible to radium and roentgen rays; accessibility, and the resistance of the normal uterine tissue and vaginal mucosa are favoring factors. Bowing and I have reported five-year end-results in a large group of cases of carcinoma of the cervix; also, in carcinoma of the uterine fundus we found unexpectedly good results, although this is still more of a surgical problem in the operable case. In cases of carcinoma of the rectum we found good results in many cases, but not nearly such favorable results as those obtained with cervical lesions; the normal rectal mucosa is too susceptible, and we had to work in an infected field. Carcinoma of the tongue and pharynx are other conditions which are amenable to radium, also carcinoma of the skin and lip; however.



malignant growths of the esophagus, stomach, small intestine, lungs, liver, and other deep-lying organs, are rarely benefited by irradiation.

Through the centuries, the attitude toward treatment of carcinoma has gradually changed. The original idea was that of entire destruction, and the cautery was the usual agent employed. However, in recent times the idea of aiding resistance of the patient has gradually evolved, with building up of his natural defenses, in addition to treatment of the local lesion. This attitude has been assisted by the recent grading of carcinomas according to pathologic differentiation. The high grade, undifferentiated epitheliomas are faster growing, tend to metastasize to distant organs, and take life quickly, but are fortunately more sensitive to radium and roentgen rays. Irradiation tends to drive the malignant cell through a more differentiated stage, accelerating the life cycle of carcinoma cells and stroma and producing an arrested, senescent state. The low grade, more differentiated carcinoma cell varies in radiosensitivity, as a rule, and may extend slowly for years without widespread metastasis. If a low-grade type of growth is encountered, the patient has apparently a natural defensive reaction to the carcinoma. I recall one patient treated with radium at The Mayo Clinic, for a squamous cell epithelioma of the cervix. A six-year cure was obtained, but the patient returned with a totally different malignant condition; namely, a huge melano-epithelioma arising from pigmented moles on the dorsum of the thorax. The pelvic condition appeared healed, but this new malignant growth caused death in six months from its inception; apparently the patient's defense mechanism to carcinoma collapsed. Another case was that of a woman who had had a carcinoma of the breast removed surgically at The Mayo Clinic in 1910; in 1932 she returned with cutaneous metastasis, an event which would have occurred in most cases in a few weeks or months after the operation. Her natural defense against carcinoma must have been unusually high. Another patient was a man who was observed with an epithelioma of the lip in 1932, and with metastasis to the cervical nodes; the growth had recurred after an operation for epithelioma of the lip in 1913, another instance of strong defensive mechanism. These cases could be multiplied endlessly.

Radium as utilized in recent years is not em-

ployed to exert its caustic and destructive effect, but to arrest the spread of the carcinoma and to build up the patient's own defensive mechanism. This is accomplished, in our opinion, in part by the heavy filtration around the applicators, by which the more caustic rays are stopped. Another factor working toward the same end, is substitution of massive doses, given at one sitting, by fractional or divided doses; that is, smaller amounts are given over longer periods of time, although a large total dose is reached. Carcinoma appears to start locally in a few cells, which, due to some unknown stimulus, begin to grow rapidly and abnormally. If the internist can recognize the malignant growth in its early stage, before spread by extension and metastasis has occurred, and the growth is accessible, radium properly applied should arrest the condition. The radiologist works in close coöperation with the surgeon. Some lesions may respond best to surgical excision and prophylactic treatment with radium. Biopsy is always advantageous, except when the growth is covered by normal tissue. Treatment applied against carcinoma is perhaps analogous to the conquest of fire in the home. The old-fashioned way of fire-fighting, consisting of application of tons of water after obtaining access to the fire itself by liberal destruction with the fire-axe, was comparable to the former method of attacking carcinoma with the cautery. Fire-fighting has progressed; the attempt now is to discover fire at its incipency, smother it with a chemical not destructive to neighboring structures, and prevent extension and widespread dissemination of the flames. This is roughly paralleled by modern methods of treatment of carcinoma with radium; the attempt is to smother or arrest the growth of malignant cells by highly filtered gamma rays, and still to preserve healthy and intact the defensive barriers of normal surrounding tissue.

For patients with carcinoma, who cannot be cured by irradiation, the value of palliation must not be minimized. Often, at the beginning, the hopelessness of attempting cure is recognized, and a limited course of treatment, suited to the patient's strength, must be planned; however, relief of pain and prolongation of life are accomplishments well worth while. In certain fatal diseases, such as chronic forms of leukemia and Hodgkin's disease, palliation is obtained from

irradiation, that could not be gained from any other form of treatment.

Although treatment of carcinoma may be spectacular, progress against benign and inflammatory lesions has been perhaps the main advance in treatment by irradiation. At The Mayo Clinic, of the patients who receive treatment by radium annually, more than 30 per cent are treated for benign conditions. Many of these lesions cannot be treated so successfully by any other method, and the results are most satisfactory. Radium is practically a specific in menorrhagia of the menopause, in many cases of uterine fibroid tumor, in treatment of some tuberculous lesions, and for many types of birth marks. It is also of inestimable value in many acute infectious conditions, as in the treatment of acute parotitis arising after a major surgical operation, and in the treatment of carbuncles, cellulitis, abscesses, and erysipelas. The rationale of treatment in many of these inflammatory conditions is not thoroughly understood, but appears to be a strengthening of the local defensive mechanism. The infiltrating lymphocytes in an acute inflammatory process are quickly broken down by irradiation, and one hypothesis suggests liberation of protective substances on disintegration of the lymphocytes. Fortunately these benign lesions can all be best treated by small doses, far below any destructive level, and well within limits of tolerance, for I can conceive of nothing more unfortunate than to treat a benign, curable condition and through lack of skill produce a serious, intractable lesion.

#### SUMMARY

The therapeutic radiologist is a physician primarily, and, besides his knowledge of the physical principles of treatment by rays, must possess a good clinical background, and have experience in selecting the type of case which radium will help.

The best results from treatment with radium are obtained in institutions possessing a sufficient supply of radium, with a staff of physicians skilled in its use; perfect coöperation between radiologist, internist, surgeon and pathologist is essential.

Radium is too powerful a substance to introduce into the human body by way of the alimentary tract or hypodermically; only the natural rays of radium should be employed in treatment.

Hence, with present knowledge, the sale to the public of radium emanators and waters and of other appliances is harmful and may produce disastrous late effects. Indiscriminate rental of radium to physicians who have not specialized in this work is not conducive to the best results.

Ideas of treatment of malignant growths are changing. By using radium in a different manner than formerly, the attempt is made to smother or arrest the growth of carcinomatous cells, and to build up the inherent defenses of the patient; caustic effects are avoided. Many of the common types of carcinoma are amenable to treatment, especially if treatment is instituted early; other types are not affected. Even in the late stages of carcinoma, palliation can be accomplished by proper treatment.

Many benign tumors and inflammatory lesions are readily cured by treatment with radium; much progress is being made in this field, and it is increasing steadily.

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## THE USE OF SPINAL ANESTHESIA IN GASTRIC CRISIS IN TABES DORSALIS\*

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VERY few human diseases have been subjected to the variety of therapeutic procedures that have been used for the relief of the gastric crises of tabes dorsalis. Gastric crisis constitutes one of the most serious accidents of tabes, and attempts at its relief run the gamut from stretching of the solar plexus,<sup>3</sup> to gastroenterostomy, to section of almost every nerve associated with the stomach or the chest wall. The non-surgical measures employed for its relief represent the acme of medical ingenuity. It is with some hesitation, therefore, that one offers any additional procedure for an already overburdened armamentarium; but the relief obtained by the use of a spinal anesthetic during an attack of gastric crisis seems to warrant this report.

### SEMEIOLOGY

In order the better to understand the condition that we are treating, a very brief summary of the symptomatology of gastric crises is included here. There are three elements in the clinical picture, namely, pain, vomiting, and disturbance in gastric secretion.<sup>1</sup> These three symptoms do not always occur simultaneously, as there may be severe abdominal pain without vomiting. However, the vomiting is rarely without pain. The clinical picture usually develops suddenly and has no relation to the taking of food. It may come on when the stomach is full or empty, may awaken the patient from sleep, or may be precipitated by the taking of food. In one patient the intravenous injection of neosalvarsan precipitated an attack on several occasions. Like other tabetic pains, the attacks may occur in "bouts," the patient remaining free from symptoms for months or years, and then having a series of attacks lasting from a few hours to several weeks. That the pain is excruciating is attested by the large number of sur-

gical measures that have been employed for its relief. Curiously enough, the symptoms usually cease as abruptly as they begin and whatever therapeutic agent is being employed at the time is enthusiastically hailed as a new remedy, and brilliant results are anticipated. However, no remedy heretofore suggested has brought relief consistently in all cases.

A sufficient number of patients have not yet been treated by the method I propose to enable one to say definitely that it will do what the others have not done. Nevertheless in view of the pathogenesis of gastric crises one may presume that the method suggested here is worthy of trial. If to some this report seems premature, possibly the fact that it is rendered only with the thought of stimulating further investigation along this line may militate against that impression.

### PATHOGENESIS

Numerous theories have been propounded relative to the pathogenesis of gastric crises in tabes. The "central" theory of the Germans has been abandoned by many neurologists. The theory that the pain and vomiting are due to involvement of the vagus nerve lacks support in view of my results with spinal anesthesia. These results would seem to indicate the correctness of the theory of the dorsal origin of gastric crises.

Like other abdominal viscera, the stomach has a double nerve supply. Parasympathetic fibers reach it through the vagus nerve, and sympathetic impulses are conveyed to it by the greater splanchnic nerve. Each of these nerves has an afferent and an efferent component. The fibers comprising the greater splanchnic nerve are derived from the thoracic portion of the spinal cord, that portion from which arise also the intercostal nerves. The splanchnic fibers enter and leave the cord through the posterior roots of the spinal nerves. From the dorsal gray matter of the cord nerve pathways ascend to the motor vagus nucleus in the medulla oblongata, and from

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this nucleus motor impulses are conveyed to the stomach by the vagus nerve, completing the reflex arc. In Figure I stimulation by an irritative lesion such as occurs in tabes at A would cause impulses to ascend along the line designated by the arrow to the motor vagus nucleus in the

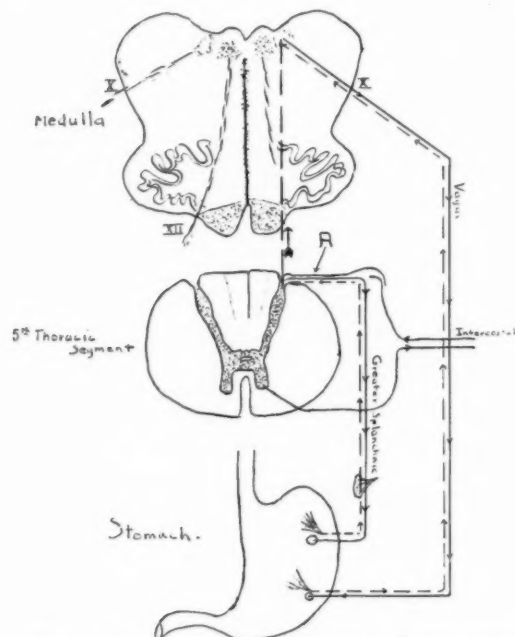


Fig. 1. The reflex of gastric crises (modified from Castelli and Tinel).

medulla. From here impulses would be carried out over the vagus nerve to the stomach and cause vomiting. Furthermore, stimulation at A would also excite that region of the cord which gives rise to the intercostal nerves. This would account for the excruciating girdle pain accompanying or occurring independently of the vomiting in the gastric crises of tabes.

Any agent rendering the posterior spinal roots insensitive to the stimulation of an irritative lesion such as is seen in tabes, theoretically should relieve the pain and vomiting of gastric crises. This is what happened in the case treated in this manner by me.

#### CASE REPORT

Miss O. L., aged twenty-seven, was admitted to the medical service of Ancker Hospital, Saint Paul, on July 4, 1921, with family and past histories that were

irrelevant to her complaints upon entrance. She stated that on March 24 she had for some unaccountable reason begun to vomit. This vomiting persisted for three or four weeks, was accompanied by severe epigastric pain, and did not bear any relation to food either qualitatively or quantitatively. In the early part of May she was operated upon by a local surgeon for a "tumor" in the left upper abdominal quadrant. This gave her considerable relief and she remained fairly comfortable until the early part of June, when the vomiting recurred and persisted until the time of the patient's admission to the hospital. Her physical and neurological examinations were recorded as negative. Roentgenograms and analysis of the gastric contents were negative and the attending physicians made a diagnosis of gastric neurosis. On July 13 she was discharged as improved.

On June 7, 1923, the patient was again admitted to the medical service with a recurrence of her former complaints. At that time it was found that her pupils were irregular and unequal, and that the knee jerks were absent. The Wassermann reaction of the blood was negative, but the cerebrospinal fluid was not examined. After three days of symptomatic treatment the patient was discharged as "improved" with a diagnosis of probable cholecystitis.

On August 16, 1926, the patient was again admitted to the medical service, stating that since her last admission she had had six or seven recurrences of her former trouble. Two years previously a cholecystectomy had been performed without any relief of symptoms. (This was the second laparotomy performed on this patient for a non-surgical condition.) Subsequent to the operation the patient began to attend the Wilder Dispensary in St. Paul, where a diagnosis of syphilis was made and treatment instituted. The patient took her treatments irregularly until her admission to the hospital. Ten days after entering she was discharged as "improved" with a diagnosis of syphilis and post-operative adhesions.

The next admission was on June 26, 1927, at which time the patient was transferred to the neurological service. Neurological examination showed Argyll-Robertson and unequal pupils. The knee and ankle jerks were absent, there was bilateral ataxia with lost deep pain sensibility, and a positive Romberg. Blood and spinal fluid examinations gave normal findings. (Patient had received considerable antileptic treatment at the Wilder Dispensary.) A diagnosis of tabes dorsalis with gastric crises was made and the patient was discharged on August 27th as improved. In view of the negative serological findings, further antileptic treatment was not considered advisable.

The hospital records show that between January 7, 1928, and June 26, 1931, the patient was admitted to the hospital eleven times for the relief of gastric crises. Her average stay was 17.6 days and the average free interval between attacks was three months and ten days. The interval figure is not accurate because the patient had numerous attacks for which she did not enter the hospital. Recorded attacks occurred at inter-



vals of as short as six days, while the longest free interval was eleven months and nineteen days. These figures are included for future reference in determining whether or not the treatment has any effect on the interval between attacks.

During the period referred to above, many forms of treatment were tried with varying results. On one occasion the attack was relieved by a hypodermic injection of morphine. Once it stopped after the administration of a hypodermic of sterile water. On two occasions spinal drainage seemed to give some relief, and on two other occasions there was no change in the patient's condition after spinal drainage. Once the attack ceased spontaneously when the patient was not receiving any medication whatever. During another stay in the hospital after spinal drainage had failed to relieve the patient, she was given frequent doses of pantopon hypodermically with no relief, and the attack stopped two days after all medications were discontinued.

On June 26, 1931, the patient was readmitted to the hospital having another gastric crisis which had been present for eight days. The neurological findings were the same as on the previous admission and the patient was markedly dehydrated. Dr. John Abbott of the surgical service was consulted and after discussing the case injected 2.0 c.c. of spinocain slowly into the lumbar subarachnoid space, using the customary technic. The head of the operating table was then lowered. At first there was no effect on the patient's pain and she went into a state of collapse. She became extremely weak, her pulse became rapid and of poor quality, and her respirations almost ceased. The head of the operating table was lowered still further and artificial respiration employed. Forty minutes elapsed before the patient was considered strong enough to return to her room. She then complained of excruciating pains in her feet. The pain gradually spread upward until it involved the entire body up as far as the chest, and it became necessary to administer a hypodermic injection of pantopon. The pains then subsided, the patient did not have any more vomiting and was discharged on July 3, feeling as well as ever.

On October 6 the patient returned to the hospital having another crisis, and she asked for another spinal anesthetic. Because of our previous experience with collapse, the patient was given 500 c.c. of a 5 per cent solution of dextrose intravenously before going to the operating room. One-half hour after an endolumbar injection of spinocain, the patient experienced relief from all symptoms. She was discharged in a few days feeling as strong as ever.

On December 12, 1931, at 2 p. m., the patient was given another injection of spinocain for gastric crisis by the intern, Dr. C. E. Watz. His notes are as follows:

2:30 p. m. Patient feels fine—smiling. Blood pressure, 118/78. Pulse good. Patient is very well pleased with treatment, having had no reaction this time.

Dec. 4. Had some pain in toes and calf muscles last night. This has gone away and patient asks for

more food today. No nausea or vomiting. Blood pressure, 140/98.

Dec. 5. Patient feeling very well. Receiving super-nourishing diet. No pain, very cheerful.

Dec. 6. Able to eat everything. When up yesterday had some nausea and distress but no pain.

Dec. 8. Normal yesterday. This morning had some nausea. Ate breakfast but vomited it. No pain. Has eaten rest of meals. Feels fine.

On December 14 the patient was discharged from the hospital and has remained well to date.

#### POSSIBLE DANGERS OF THE TREATMENT

*Shock.*—This occurred with our first treatment when the patient was very much dehydrated. However, if fluids are given intravenously before the injection of a spinal anesthetic the danger of shock from our procedure should not be any greater than in other conditions for which this form of anesthetic is used.

*Damage to the Spinal Cord.*—Loyal Davis and his associates<sup>2</sup> injected spinocain into the spinal subarachnoid space in a series of dogs and then examined the spinal cords at varying intervals after the injection. They found changes in the meninges, the anterior horn cells, and in the myelin sheaths at the periphery of the cord. However, the changes in the anterior horn cells and the myelin sheaths were not as pronounced in cords examined ninety days after injection as in those examined earlier. This would indicate that these changes are not permanent. The meningeal reaction was marked only in those animals receiving massive doses of spinocain in comparison to their body weight.

However, in spite of the fact that normal cords probably do not receive any permanent severe damage from the injection of spinocain, one hesitates to bring any foreign substance into contact with a spinal cord that has been already damaged by a pathologic process. Just what effect spinocain has on the cord of a patient suffering from *tabes dorsalis* is at present unknown and the matter demands further investigation.

#### LIMITATIONS OF THE TREATMENT

Spinal anesthesia is *not a cure* for the gastric crises of *tabes*. The best that we can hope to do is to relieve the single attack. Since some cases respond to other forms of treatment (spinal drainage, malaria, pituitrin, sedatives) the procedure suggested is not indicated in every case. It is to be used only in those cases in which the

patient's condition has become serious and in which other attempts at relief have failed. In patients having attacks of gastric crisis of unusual severity but at infrequent intervals, spinal anesthesia also might be indicated.

#### SUMMARY

1. Gastric crisis is one of the most serious accompaniments of tabes dorsalis.
2. Innumerable surgical and medical procedures have been used for its relief with inconsistent results.
3. Spinal anesthesia promptly stopped an attack of gastric crisis on three different occasions in the same patient.

4. If one accepts the theory of the dorsal origin of gastric crises in tabes, the rationale of spinal anesthesia in this condition becomes clear.

5. Possible sources of danger and the limitations of the treatment are mentioned.

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### SODIUM AMYTAL ANESTHESIA IN OBSTETRICS\*

A REPORT OF ITS ORAL AND INTRAVENOUS USE IN SEVENTY-EIGHT CASES

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THE progress made in safely relieving the sufferings of obstetrical patients has not kept pace with the progress of pain relief in other fields of medicine. The employment of analgesic and anesthetic agents during labor necessitates the safeguarding of the lives of both the mother and her unborn child. It is a more complicated and individualized problem than that met with in general surgery. Nevertheless, an increasing number of women nowadays are refusing to submit to the sufferings borne by their mothers and grandmothers. Safe methods of relieving pain, therefore, merit our attention even though they entail the expenditure of additional time on the part of the medical attendant, require skilled nursing assistance, and add to the patient's expense.

During the past eight years numerous experimental and clinical observations have been made on the barbituric acid derivatives so that our knowledge of their pharmacologic effects has become quite clearly defined. Sodium amytal (sodium iso-amyl-ethyl-barbiturate), which has been most widely studied and used, was first recommended as a general anesthetic, but later was found to be more suitable for use as a basal anes-

thetic agent to be followed by the administration of an inhalation anesthetic.

A year and a half ago I reported a series of forty-six cases in which sodium amytal given intravenously and supplemented by an inhalation anesthetic<sup>1</sup> was used to alleviate pain during labor.<sup>2</sup> The present paper attempts to record and evaluate in seventy-eight cases some of my further experiences with the drug administered intravenously in some patients, orally in others, and by both routes in the remainder.

*Intravenous Administration.*—In forty-six cases of the present series, when labor was well established as determined objectively by 4 or 5 cm. dilatation of the cervix and regular uterine contractions occurring every four or five minutes, or subjectively in multiparæ by complaint of active labor pains, a clear, freshly prepared 10 per cent solution of sodium amytal was injected into a vein in the arm at a rate not exceeding 1 c.c. a minute. Slow injection of the solution was considered to be exceedingly important, for it has been shown experimentally by Swanson and Shonle<sup>3</sup> that the rate of injection appears to control the intravenous toxicity of the drug, and it recently has been demonstrated clinically by Ruth and Paxson<sup>2</sup> that while analgesia is quickly produced by rapid injection, it soon wears off so that

\*Read before the annual meeting of the Minnesota State Medical Association, St. Paul, May 25, 1932.

the desired effect is lost. The first dose ranged from seven and one-half to ten grains determined somewhat by the body weights of the patients, but largely by their responses to the medication during injection. They became drowsy when four and one-half to six grains had been given and were soon sound asleep, failing to respond to questioning and often breathing somewhat noisily. One and one-half to four grains more of the drug were then given before the needle was withdrawn from the vein. When contractions occurred during administration, injection was temporarily stopped because the patients usually became restless and attempted to move their arms. In twenty-six cases (56.5 per cent) of the intravenous group a single dose of seven and one-half grains was given one-half to five hours before delivery, the average time being one and three-fourths hours. In the twenty other cases (43.5 per cent) of this group a second, or even a third, dose ranging from five to seven and one-half grains was administered at average intervals of two and one-half hours, but sometimes at intervals as short as one-half hour or as long as four or five hours, depending upon signs of returning consciousness, such as rational responses to questions and complaint of severe pain. If delivery was imminent, however, the drug was not repeated, but nitrous oxide anesthesia was started at once and given during contractions or operative procedures until labor was terminated. Total intravenous dosage in the twenty cases receiving two or three injections frequently was fifteen grains but never exceeded twenty grains.

*Oral and Combined Administration.*—In thirty-two cases in which administration of the drug was started orally, various methods were tried, but one of the two following methods was usually carried out. Capsules containing three grains of sodium amytal were given at one-half hour intervals early in labor until nine to fifteen grains had been given; or nine, or sometimes twelve, grains were given in a single dose when labor was well established. Whichever method was followed, smaller doses of three or six grains occasionally were repeated at one to three hour intervals when consciousness appeared to be returning, but a total oral dosage of more than eighteen grains was never given.

Of these two methods, the second one gave more satisfactory results. The first method of

giving small, divided doses was thought to be particularly suitable for longer primiparous labors, but it often failed to give satisfactory relief because of rapid progress of the labor and was abandoned for intravenous administration of five to seven and one-half grains after three to nine grains had been given by mouth. In all, eleven, or about one-third of the thirty-two cases in which oral administration was started, were also given intravenous sodium amytal, the total combined dosage ranging from ten to twenty-one grains.

*Clinical Observations.*—Amnesia was the most gratifying effect of the medication. Of the forty-six patients receiving only intravenous medication, thirty-two (69.5 per cent) had complete amnesia for their labors following administration, fourteen (30.5 per cent) had partial amnesia, and only three of the latter remembered a great deal about their labors or were so dissatisfied with the relief obtained that they could be classed as failures. Of twenty-one patients who received only oral medication, ten (47.6 per cent) had complete amnesia and eleven (52.4 per cent), partial amnesia beginning one-half to three-fourths of an hour after a single large dose or soon after receiving the third three grain capsule. In the complete series, the period of the amnesia often lasted as long as three or four hours after labor when the last dose of the drug had been given within an hour before delivery. Patients who received the last dose of the drug more than two hours before delivery and who received ten grains or less, were usually conscious and co-operative at the end of labor.

Restlessness during contractions or when the patients were disturbed was the most objectionable feature of the medication. While fewer cases of marked restlessness were noted than in my first series, thirty-six (56.2 per cent) out of sixty-four in which this symptom was recorded on the charts were restless enough to require constant watching, eighteen (28.2 per cent) were only slightly restless, and ten (15.8 per cent) were quiet. The route of administration did not seem to bear any relation to the degree of restlessness. The temperaments of patients were, however, important factors, nervous and excitable patients much more frequently exhibiting restlessness than calm, even-tempered ones. Patients were quiet after delivery and usually slept for several hours.

Blood pressure readings during intravenous administration were not made routinely. In the few cases in which they were observed, the systolic pressure was found to drop 15 to 20 mm. of mercury, and the diastolic pressure 10 to 15 mm. during administration. The pressure gradually rose after the injection was finished and was normal again in one-half hour.

No slowing of labor was observed. On the contrary, labor in at least one-half of the multiparæ was accelerated so obviously that nurses on the obstetrical floor soon learned to make preparations for taking the patient to the delivery room whenever intravenous sodium amytal was given to a multipara in active labor. This shortening of labor is probably due to relaxation of the cervix. Ruth and Paxson<sup>2</sup> call attention to the phenomenon in a recent paper and consider the intravenous administration of the drug to be of value in treating dystocia due to a spastic cervix or a retraction ring.

After patients were under the hypnotic effects of the drug, it was necessary to encourage them to take sufficient fluids. Also, as one would expect, voluntary voiding of urine was often omitted and catheterization frequently became necessary. No post-partum complications could be attributed to the medication.

Although mild apnea of infants at birth was frequently observed, there were no cases of true asphyxia which could be attributed to the drug in this series. Fetal heart rates during labor were not altered. Nursery attendants noted that about three-fourths of the infants were sluggish at breast for thirty-six to forty-eight hours after birth, and required coaxing and the additional expenditure of time in giving them complementary feedings, but no further effects of the drug could be correlated with post-natal behavior or weight curves.

*Discussion.*—Considering uniformity of action and the amount of relief obtained by the patient as criteria, a comparison of the results obtained in intravenous and oral administration indicates that the former route was more satisfactory in this series of cases. Intravenous administration has certain disadvantages such as its inherent technical difficulties and the dangers from too rapid administration. Theoretically there are also the possibilities of acute respiratory and circulatory depression and the dangers of disturbed "intravenous reflexes" which have been

stressed in a recent report on the intravenous administration of barbiturates by the Council on Pharmacy and Chemistry of the American Medical Association.<sup>1</sup> With the smaller doses administered in obstetrics, ranging from 7 to 15 mg. per kilogram as compared with the doses of 12 to 25 mg. per kilogram formerly given in general surgery, I have neither encountered any of the dangerous complications warned against, nor would I expect them to occur except possibly in asthenic individuals with low blood pressures. Some of the advantages of intravenous administration are that the effect of the drug is immediately obtained; that the minimum amount required for the individual patient can be judged with a fair degree of accuracy; that elimination and destruction of the drug in the body is rapid.

Oral administration includes among its disadvantages difficulties of determining individual dosages and the possibility, as Zervas<sup>5</sup> has pointed out, that "the peak effect of the drug may not be obtained when desired." It has the advantages of easier technic and less acute respiratory and circulatory effects. Also, the drug can be given earlier in labor, and if satisfactory results are not obtained from oral administration it can be supplemented by smaller doses intravenously. Oral administration yields its best results in long primiparous labors while intravenous administration is more satisfactory in rapid multiparous labors or when used for patients first seen late in labor.

#### CONCLUSIONS

1. The intravenous administration of comparatively small, individualized doses of sodium amytal gives more uniform and satisfactory pain relief during labor than when the drug is given orally.

2. Oral administration of somewhat larger doses, however, because of its simpler and safer technic should be used whenever possible since it can be supplemented by intravenous injections of the drug if satisfactory relief from pain is not obtained.

3. Either method of administration, when supplemented by an inhalation anesthetic, produces gratifying amnesia and safe and adequate relief from pain during most labors.

4. Neither the oral nor the intravenous methods of administration produce deleterious effects on the babies.



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## OVER PRODUCTION?

"The number of physicians in France continues to increase faster than the population."

"In Hungary the number of physicians exceeds 8,000, which is too many."

"The new medical students (in Germany) enrolled for the past few years have greatly exceeded the estimated number of assimilable young physicians. It is evident that, during the past three years, 7,800 more medical students than needed have received training."

The sentences quoted above are taken from letters from Berlin, Budapest and Paris and are repetitions of statements that have appeared very frequently within recent years.

In 1900, with horseback and horse-and-buggy transportation, with few telephones and with certain diseases very prevalent that are now comparatively rare, the medical schools of the United States turned out 5,214 graduates. In 1930 less than half as many schools produced 4,565 young physicians. In the meantime there has been almost unbelievable improvement in transportation and in all the facilities of communication and there has been a remarkable diminution in the prevalence of certain diseases that formerly kept physicians busy. In the meantime, also, the number of hospitals has increased tremendously. While comparatively few of the graduates of the schools of the United States go to other countries, a very considerable number of the graduates of the medical schools of other countries come to the United States, year after year. Approximately 3,000 physicians die in the United States, each year. It is estimated that the population of this country will be "stabilized" within a few years. There is 1 physician for each 780 of the population. In 1931 there were enrolled in our medical schools 385 more students than in 1930 and the number of graduates increased by 170.

In a little booklet called "Notes on Legal Education," published by the Section of Legal Education and admissions to the Bar of the American Bar Association, some very interesting figures are presented and some very pertinent questions are asked. In the ten years from 1920 to 1930, according to this booklet, approximately 78,500 new lawyers were admitted to practice in the United States. It is estimated that the number of lawyers who die and the number who withdraw from practice each year together make 4,600, while in

the year 1931 about 9,700 were admitted to practice, so that the committee that prepared the booklet has concluded that more than twice as many lawyers are being produced than are needed. The question is asked, "Is it not time to take some steps to reduce this flood tide?"—*A. M. A. Bulletin*, June, 1932.

## VOICES ACROSS THE RIO GRANDE

Station XER, just across the Rio Grande from Del Rio, Texas, is the mouthpiece of John R. Brinkley, goat gland transplanter, mail-order dispenser of medicines and candidate for Governor of Kansas. The station has apparently been authorized by the Mexican government to increase its power from 75,000 to 500,000 watts, which, it is stated, will make it ten times more powerful than any station in the United States. The government of the United States stopped his broadcasting in Milford, Kan., and he built the station in Mexico to get around that prohibition. Experts in radio engineering indicate that the use of a current of such potency by the Brinkley station will interfere seriously with any station in the United States operating within 50 kilocycles of that used by the Brinkley station. Apparently, Brinkley can put potency into his radio broadcasting even if the goat glands will not perform a similar function for the misguided octogenarians, or instances of sexual impotency, psychic or otherwise, induced to submit to grafting operations by what they hear from over the Rio Grande. A letter just received by the American Medical Association from the Camara Nacional de Comercio de Nuevo Laredo indicates that Cancer Quack Norman Baker contemplates building a station at that place, presumably to promote the industry formerly exploited through his station in Muscatine, Iowa. It should be obvious to any one that the purpose of these stations on the Mexican border is to invalidate the attempts of the Federal Radio Commission to keep clean the material coming through radio channels into this country. If this Mexican practice is to continue without interference, American users of the radio may well anticipate for the coming years as the dominating theme of the broadcasts to which they may listen the lamenting and feeble baa-baa of the castrated goat and the blatant charlatanism of Norman Baker. (*Jour. A. M. A.*, October 15, 1932, p. 1355.)

## PRESIDENT'S LETTER

DECEMBER is here again; the year 1932 will follow its predecessors shortly. It has been much the same as 1931, with the exception that the ravages of the depression are even more apparent. The coming winter, in spite of the fact that there appear some hopeful signs on the horizon, is likely to be hard on a large percentage of our population. The medical profession will be called on to make even greater sacrifices, and to provide care for even more people, without remuneration, than before. This has been cheerfully done before and will be done again, but the inequality of this increasing burden is being more and more recognized by thinking people. We may expect various plans to be brought forth by the laity, some of them altruistic and unselfish, others will be tinged with selfishness, and perhaps some few with actual malice toward our profession. Organized medicine must have its own plan to meet those proposed, and must not swerve from the principles of its code of ethics, proved by time to be of advantage to the public and to the profession. The year 1933 is a legislative year in Minnesota and we, as a component of organized medicine, must see to it that we are faithfully represented to protect not our own interests so much as to protect those of the people, our patients. The lack of party system and the use of the so-called nonpartisan method in our state legislature makes it difficult to determine just who is backing the various measures that are brought up. Fortunately we have a man at the head of our Committee on Public Policy and Legislation, Herman Johnson, who has an uncanny sense in detecting the source and purpose of the various measures that are proposed. Our Legislative Committee has asked of our legislators only those things that are best for, and that are in the interest of, the public, and has never asked for anything primarily for our own benefit. This committee is today perhaps the most important one that we have in our state association and we are fortunate indeed that such men as Herman Johnson and Ben Wright are willing to give so freely of their time and talent. They, with the other members of this committee, are our leaders in these matters, and we must look to them for guidance and give them our full support.

This is the last of my monthly letters. To have served as your president for the past year has been an honor, a pleasure, and a privilege. As I have journeyed about the state and met many of our members, I have been impressed by their interest, earnestness, and broad grasp of medical matters. I wish to pay tribute also to our secretary, Dr. E. A. Meyerding, and his staff. A visit to our headquarters at 11 West Summit Avenue, St. Paul, is well worth the time of any member of the association. There will be seen a busy office force, engaged in furthering and protecting the health of the people of our state. The rare but happy combination of a state medical society working hand in hand with a state public health association is there encountered, and its mutual advantages are more readily appreciated. Under a common secretary, the activities of both associations are accomplishing far more than we realize. As I look back on the past year it stands out vividly in my mind as a most pleasant one on account of the many renewals of old friendships that I have made, and I hope the establishment of new ones. I pass the torch to our new president, Dr. N. O. Pearce, wish him Godspeed, and say to you all, "au revoir."

*M. S. Henderson.*

President,  
Minnesota State Medical Association.

# EDITORIAL

## MINNESOTA MEDICINE

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## SAINT PAUL'S GROUP HOSPITALIZATION PLAN\*

Today the cost of hospital care for the average employed man or woman is serious, and the vast majority of gainfully employed persons find it difficult, if not impossible, to meet the cost of illness. Because the hospitals of Saint Paul believe there is an opportunity for them to provide scientific service to respective social classes who can budget their incomes to provide periodic payments of small sums to insure hospital care when it is needed, they propose to organize, for

\*The idea of this group hospitalization plan did not originate here. Somewhat similar plans are now in operation, or in the process of organization, in the larger cities throughout the country.

full or part-time employed persons, a group hospitalization plan whose fundamental principle is to provide hospital care for twenty-one days each year to its members for a fee of seventy-five cents (75c) per month, or nine dollars (\$9) per year. Thus, the hospital bill will be carried by a group rather than an individual.

Such an organization will be called "Hospital Service, Incorporated," and will be controlled by the participating hospitals through a Board of Trustees composed of one board member and the superintendent of each participating hospital. Thus, there will be eliminated the possibility of abuse by either an individual or by a commercial organization, such as those who are promoting various hospitalization plans throughout the country and whose sole interest is monetary. All benefits derived from the plan proposed for Saint Paul will be given to the patients and the participating hospitals.

There is no thought of profit-making in this plan, but only to collect sufficient funds from the groups to cover the actual cost of hospital care for those members who need hospitalization. Nor should this be interpreted as an insurance plan, as it offers only hospital service to patients under physicians' care. Such a plan in no way competes with the physicians' professional services.

To establish and make workable this group hospitalization plan it will be necessary to obtain three to five thousand members, then the law of average will apply safely, although the memberships at no time will exceed the margin of the number of unoccupied beds of the participating hospitals.

The organization will deal with groups, not individuals. Each member will be given full liberty in the choice of one of the participating hospitals, as well as his choice of physician, provided the latter is in good standing and acceptable to the selected hospital.

The membership fees will be collected by payroll deduction and paid to the Hospital Service, Incorporated, which will in turn reimburse the hospitals for their services.

To each member, in case of illness necessitating hospitalization, will be furnished hospital care, including board and accommodation in a ward bed (although he may have private or semi-private room accommodation by paying the difference between the two, less a discount of 25 per cent); operating room service, anesthetics; general nursing, including undergraduate and graduate staff; service of dietitian; clinical laboratory service to the amount of \$15; X-ray

to the amount of \$15; routine medicines, hypodermics; surgical dressings, and all other usual hospital services.

In case hospitalization beyond the number of days allowed is required, service will be furnished at the regular rate, less a 10 per cent discount, for a period not exceeding ninety days.

Hospital service required when a member is not confined to the hospital will be furnished at the regular rate, less a 10 per cent discount.

Services not furnished are those of the physicians, surgeons, and special nurses; nor are special nurses' board and special prescriptions supplied.

A member will be given hospital service only on the recommendation of his physician who is a member of the medical staff of the selected hospital, or who is acceptable to the selected hospital, and only during such time as he is under treatment and care of such physician. He is to leave the hospital when discharged by his physician; otherwise, he will be requested to pay in cash full hospital charges for services received after advisement that further hospitalization will be unnecessary.

Hospital service will not be furnished in cases of injuries covered by employers' liability insurance, as outlined in compensation laws of the State of Minnesota, or automotive liability insurance; or, except for preliminary hospitalization pending diagnosis, in cases of mental diseases, contagious diseases or tuberculosis.

Hospital service for dependents of members will be furnished at a discount of 10 per cent from the regular hospital charges, not to exceed a period of ninety days.

However, the hospital service is not given to members who become victims of an epidemic or public disaster, but, in case of epidemic or public disaster which occasions the over-crowding of the capacity of the contracting hospitals to such a degree that it is not possible to provide accommodations to ill group members who are not victims of the epidemic or public disaster, and in case adequate accommodations cannot be secured in other hospitals of the plan, the Hospital Service, Incorporated, will refund to the member the full amount paid by him during the then current year; provided, of course, services have not been secured from any one of the participating hospitals, in which event a proportionate amount of fee paid will be refunded and such payment will constitute a full and final discharge of the obligations of the participating hospitals.

To the physician such a plan offers the preservation of the personal relationship between him and his patient; diverts to him money, in payment of his professional fee, which otherwise might have been expended for hospitalization; and retains for him private patients who, because of limited finances, otherwise might have been forced to become charity cases.

To the hospital, now running only 50 per cent capacity at a loss, the plan not only guarantees an increase in the hospital's daily census, thus enabling it to use its facilities to greater advantage at a lower cost; but guarantees a fixed revenue, thus assisting in the solution of the problem that threatens the continued and efficient hospital service already weakened by decreased gifts, inadequate support from the city, and increasing demands for treatment on the part of those who can pay little or nothing.

To the community it offers the opportunity in great part to provide against the financial hazards of illness by shifting the burden of the cost from the individual to a group; and many people who now find it necessary to accept charity will, under this plan, become private patients, thereby reducing the enormous amount of charity work demanded of the city.

To the individual, who, under ordinary circumstances remains at home during an illness, quite often without benefit of a physician's care, because of a limited income, it means efficient hospital care, with early diagnosis, proper treatment, et cetera; thus oftentimes saving him from a fatal termination, and in a great majority of cases returning him to his work at an earlier date.

It is sincerely believed that the group hospitalization plan will furnish a bulwark against other radical trends that might revolutionize the practice of medicine. It is not believed, however, that this plan is a panacea, but it appears to offer, particularly at this time, the greatest promise of deliverance from our economic distress and assist in assuring future financial stability of the hospitals.

PETER D. WARD, M.D., and  
A. M. CALVIN

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#### FINAL REPORT OF THE COMMITTEE ON THE COST OF MEDICAL CARE

The final report of the Committee on the Cost of Medical Care will have been made public at a meeting in New York City on November 29. Through the courtesy of the Committee opportunity was granted for a perusal of the report in advance.

The Committee has completed a vast amount of work at great expense and has succeeded in gathering a wealth of valuable statistics. These statistics, although they refer in large part to pre-depression days, should be of great value in an attempt to solve problems involving economic phases of medical practice.

The Committee felt justified in making certain recommendations. Those regarding more Public Health activities, the training of more medical students to fit them for public health activities,



the restriction in the number of specialists in medical practice, and the establishment of standards and control of specialists, met with general approval on the part of the Committee. All seemed to agree on the important and essential part played by the general practitioner in medical practice.

As to some of the main recommendations in the majority report there was a marked divergence of opinion which was strongly expressed in the minority report. The majority thinks that group practice preferably built around a hospital as a unit will help to solve the problems of better medical care at less cost. The minority report calls attention to the disadvantages of group practice and states the belief that the increase in medical groups will put the individual practitioner out of the running, especially if insurance as a solution of the unequal distribution of medical costs becomes generally adopted. The minority sees in group practice an attempt to apply the method of organization and mass production to the practice of medicine, which is so necessarily individualistic.

Another main recommendation of the majority is the advocacy of insurance to provide the necessary and ideal amount of comprehensive medical care which includes doctors, dentists, nurses, hospital care and drugs. The report brings out very well that the cost of comprehensive medical care evenly distributed, estimated at twenty to forty dollars per individual per year or 100 to 200 dollars per family of five, is more than the 50 per cent of families with \$2,000 or less annual income (1928 figures) can or will voluntarily budget or insure against. Universal insurance would therefore necessitate compulsory insurance and assistance from taxation. The minority points out the evils which are sure to accompany the general adoption of insurance and group care.

Contract practice in general receives considerable attention in the report. The dangers inherent in such wholesale practice are likely to result in putting the practice of medicine on an entirely money basis, with cut-throat competition by individuals or groups and resulting inferior work.

The report as a whole deserves careful consideration on the part of the medical profession. Doubtless it will receive great publicity. If it results in widespread insurance by private companies or the state and if group practice of one kind or another increases, present day methods of medical practice will be greatly affected. There are many dangers in the proposals made in the majority report.

Private individualistic practice has stood the test of time. We know the dire experience of European countries with state insurance and its inferior service and doubling of disability from sickness. While contract practice in itself is not

necessarily bad and in fact is the only way medical service can be supplied in certain localities, we know the inherent evils often manifest.

Each state or county society is likely to have to decide on the advisability of adopting proposed innovations in medical practice. Many have already been called upon to act in regard to insurance and contract proposals. In some the insurance rate has been so ridiculously low and compensation to the physician so meager that medical societies have not hesitated to disapprove.

As a result of the present depression and perhaps as a result of the Committee report impetus will be given to new insurance schemes involving group and contract practice. It will behoove each medical society to be on the alert to consider carefully the effect of such proposals on the quality of medical care which will result.

Most physicians, we believe, favor the general principle of insurance to cover medical costs. Universal insurance is perhaps too Utopian. Any scheme whereby all the people will be provided with the best medical care is perhaps too idealistic. Certain insurance projects such as the one being put into effect in Saint Paul to cover hospital costs should be encouraged. An organization similar in character to provide insurance to cover fees and operated by a county medical society as outlined in the minority Committee report merits careful consideration.

#### PSITTACOSIS IN MINNESOTA

On several occasions since 1904 a few sporadic cases of psittacosis have been reported in the United States. The appearance of 185 cases with thirty-five deaths in fifteen states in 1929-1930 traceable to imported parrots led to an embargo being placed on these birds on January 24, 1930. In January, 1931, cases of psittacosis were traced to contact with sick "love birds" brought in to New York from Cuba, and again in October, 1931, a few cases in New York were traced to parrakeets shipped from San Francisco, some of which had been imported from Japan. In December, 1931, four fatal cases occurred in California, traceable to infected parrakeets, and since that time some forty-three cases have been reported in California. There is evidence that the home bred birds in California are now infected.

Psittacosis appeared in Renville County, Minnesota, last September and since then some nineteen cases definitely so diagnosed and an additional eight suspected cases have been detected in the state. All the cases are directly or indirectly traceable to a shipment of infected "love birds" received in Olivia, August 1, 1932, from an infected aviary in California. Seven of the

known cases were found in Renville County, nine in Sibley County, and one each in Goodhue, Nobles and Hennepin Counties. The sale of these "love birds" at numerous county fairs has provided the channel for possible widespread dissemination of the infection.

It is well, therefore, for the profession to be psittacosis minded. The symptoms are said to resemble those of an influenza with atypical pneumonic symptoms. The infective organism is unknown. The incubation period is about six to fifteen days and the high mortality increases with age. The onset occurs with fever, which may reach 103 to 105 degrees during the second week. The pulse is rather slow, as in influenza. Nose-bleed is not uncommon. The cough is inclined to be non-productive and blood streaked sputum is absent. Leukopenia is the rule. The febrile period may last from one to three or more weeks. Relapses are not infrequent. Phlebitis is the most frequent complication.

The disease is spread in the main by members of the parrot family which either have or have had the infection. It has also been proven that psittacosis patients spread the disease and so should be quarantined and nursed like individuals with other infectious diseases. No diagnostic tests have been evolved and no specific treatment devised. Suspected cases should be reported at once to the Division of Preventable Diseases, Minnesota Department of Health, University Campus, Minneapolis (Telephone: Dinsmore 2760).

#### CHRISTMAS SEALS

The alliance between the State Medical Association and the Christmas Seal is well cemented in Minnesota. For years, the Christmas Seal program has been subject to approval of the proper state society committees and has consequently been directed into ethically and medically sound channels.

The campaign of 1932 will have an unusual endorsement from the medical profession, however, because it is of unusual importance to all of us to promote all possible activity in the fight against tuberculosis this year.

Recent very interesting studies coming out of Germany have shown the serious late effects of malnutrition among young children. The babies of Germany who all but starved during the hard times immediately following the war are now approximately 17 and 18 years old. They are physically and mentally under par in spite of the fact that many years have intervened, now, since the starvation period. Their resistance to disease, notably to tuberculosis, is very low.

The application to our own situation in America is obvious. It is clearly up to all of us to

protect the babies of from one to five years of age. They must have proper food, and, equally important, they must have all of the health protection that we can create for them.

The educational program of the Christmas Seal organization is essential to this protection. If every man and woman can be made to realize the danger to their children of contact with tuberculosis, there will be fewer infections among the children of today to lead to fatal cases of tuberculosis in young man- and young womanhood.

Demonstration through the schools of the diagnostic value of the Mantoux tuberculin skin test with X-ray is an important part of the modern Christmas Seal program. It is indispensable to an enlightened public health program in these times. Properly used, it is capable of doing much to prevent a serious rise in morbidity and mortality rates from tuberculosis as a late consequence of the depression in the United States.

#### CORRECTION

Our apology to Dr. John L. Montgomery, formerly of Minneapolis and now located in San Francisco, for our error in announcing his death in the obituary column of the August, 1932, number of MINNESOTA MEDICINE. Our error was the duplication of the same error on the part of a newspaper, and in the words of Mark Twain the rumor was grossly exaggerated.

We are reminded of the story of the Yankee in a small town in Massachusetts who made a small loan to a fellow townsman, who promised to pay it back in three months if he was still alive. The expiration date came and the loan had not been paid back. Reasoning that his fellow townsman, being a man of his word, must be dead, he circulated a report to that effect. Relatives flocked to town to render final tribute to the deceased only to find an infuriated and much alive relative.

The journal does not indulge in practical jokes, but occasionally we receive and repeat news which lacks foundation and on such occasions we are only too happy to correct the error.

#### FEEDING FORMULAS FOR INFANTS IN LAY ADVERTISING

The Committee on Foods reports feeding of an infant by routine feeding formulas and instructions distributed by food manufacturers, or according to directions, printed material, or advice of any person other than the attending physician who can personally observe the condition of the baby, may seriously endanger the health of the infant, and is considered to be in conflict with the best experience, authoritative judgment, and basic principles in infant feeding and is not permissible. No objection is taken to published directions for the preparation of mixtures for use in infant feeding. (Jour. A. M. A., July 30, 1932, p. 391.)

## MISCELLANEOUS

## SOCIAL INSURANCE (Conclusica)

EDWARD H. OCHSNER, M.D.

Chicago

The purpose of this series of articles on Social Insurance has been to arouse the rank and file of the medical and dental professions and, through them, if possible, the general public, to an impending danger; and to dispel a number of quite generally held false opinions.

The first of these is the very commonly held belief that the moment a professional man assumes a title and a government position he knows more and becomes more efficient than he ever was before, while the contrary is more often the case because of the enervating effect of red tape and paper work.

The second common error is that, by some magic, Compulsory Health Insurance is going to escape the favoritism, nepotism, graft and in fact all of the evils of politics. This is a delusion with which reformers and the intelligentsia in general are commonly afflicted. The practical man of affairs and particularly the seasoned politician does not fall into this error. Some time ago during a heart to heart conference a practical politician said what he really felt and knew to be true. He said in substance that we must remember that "We have government by politics, and you and I or all of us with a hundred thousand others cannot change this situation. I do not care whether you remove the control from the city to the state or to the federal government, it will still be controlled by politics."

The third common error again held particularly by the reformers and intelligentsia is that statisticians and economists can solve this problem unaided. Desirable, valuable and even necessary to a complete understanding of the problem as a study by competent economists is, there is one very important fact which many who have made a study of the problem do not seem to be able to realize—namely, that in a matter where personal relation is such an important element as in the practice of medicine and dentistry the ordinary formulæ employed by economists do not and cannot apply. Personal relations cannot be measured by any mathematical formula devised. It is too elusive a factor to be measured by monetary or any other standards and yet of all the factors it is by all odds the most important. Only the individual who has had an extensive experience in the practice of medicine or dentistry or the one who has had a long and serious illness seems to be able to evaluate properly this phase of the problem. Then again the lack of medical knowledge by economists makes it impossible for them to appraise the difference between the personal individual care of the patient by the private physician and the more or less impersonal mechanical care of the patient or Krankenkasse physician; nor are they so situated as to have access to individual patients, and even if they had they lack the training to know which is giving the better treatment. From the foregoing it must be evident that this type of study and investigation has its limitations in cases where the personal element enters intimately with a social or economic problem and if too much dependence is put upon it wrong conclusions are bound to be reached, or, to re-state this point a little more concisely, let us say that statistics have their value and their limitations. The more personal the matters under

investigation the less their value and the greater their limitations. One writer has expressed this idea very well in the following words: "There is real danger that the economist lost in the abundance of his researches finally overlooks the plain and easy road that lies directly before him."

Probably the most common error is the belief that Social Insurance will abolish poverty. To the contrary, it is at best only a palliative and, like all palliatives, if employed for any considerable period of time always leaves conditions worse than when first employed.

Another common error quite generally made by the more sensitive and emotional is to believe that the receiving of charity is of all things possible the most degrading. Serious as the accepting of charity is to the character of the intelligent and sensitive, there are many other things even worse and one of these is the quite general practice of malingerer which Compulsory Health Insurance and the Dole encourage and foster among the workers of a nation. There is this fundamental and very important difference between accepting charity and a health insurance stipend—the former is still considered somewhat of a disgrace while to get the latter, even through subterfuge, is considered highly respectable and clever.

There are two questions that the Compulsory Health Insurance proponents have never answered in spite of the fact that they have offered innumerable alibi that do "not alibi" and endless explanations that do not explain. First, why, if Compulsory Health Insurance improves the health of a nation as claimed by its proponents, is the death rate no lower in those countries that enjoy this "great blessing" than in those countries not so blessed? And, second, why, shortly after and since the introduction of Compulsory Health Insurance, have the number of days lost by the workers per annum steadily increased? The answer to the first question is that it does not improve the general health of the people and the answer to the second is that among a very large percentage of the working population it substitutes for the *will to get well and the will to work, the will to stay sick and the will to loaf.*

Personally I am quite satisfied that Germany and England should make their experiments in Social Insurance and Russia her experiment in State Medicine but I am happy that these experiments are being made three and four thousand miles respectively from our shores. I am firmly convinced that if we can stave off these schemes for another ten years we will be spared them because they will prove so harmful to medical practice and medical progress and so destructive to national character that we will escape their blight. Time will demonstrate that they are fundamentally wrong, a backward step in civilization.

Human progress in most lines has always been very largely the result of unhampered personal endeavor and rarely if ever the result of governmental action primarily. Will we never be able to learn from experience and must there always be recurrent periods of halt and even retrogression in human progress?

American medicine and dentistry stand today at the threshold of their greatest opportunities and beside the abyss of their greatest dangers; the former because of their marvellous advances in the recent past, the latter because they are being pestered and annoyed by a small but vociferous group of misinformed, uninformed, unwise and in a few instances self-seeking, selfish, self-appointed lay advisers. There are troubled times for these two allied professions; the men who stand firm now will deserve the gratitude of future generations of men and women.

## A FORUM OF THE COMMITTEE ON PUBLIC HEALTH EDUCATION

The reasons why the average physician joins his medical society are numerous. They are based on a mixture of professional, social and economic motives. Generally he is a member for much the same mixture of reasons that he is a physician. The one follows upon the other.

Sometimes, however, it is important to dwell particularly upon one or the other advantages of membership. It is important especially in these times when every dollar spent, whether for dues, food, clothing or entertainment, is carefully weighed. It must be possible to show, in such times, that even so customary and accepted an obligation as medical society membership pays specifically in dollars and cents.

The advantage of society membership on the professional and scientific standing of the physician may be taken for granted. It is easy to overlook the very worth while advantage that membership in good standing has upon the physician's financial condition, generally, and particularly upon his insurance ratings.

A case in point is furnished in extracts from a letter written to F. J. Savage, St. Paul, Councilor of the Fifth District, by T. E. Haberkorn, Assistant Secretary of the Medical Protective Company of Chicago.

"In reply to your inquiry," writes Mr. Haberkorn, "we advise you that our basic premium charge on the standard medical contract is \$21.00 for the \$10,000 and \$30,000 indemnity limits in Ramsey and Hennepin Counties in Minnesota.

"This differentiation has been necessitated by our underwriting experience in the two districts . . .

"Relative to the writing of medical men who do not belong to the State Medical Society, we advise you that we are not writing such men outside of Ramsey and Hennepin Counties on any basis. In Ramsey and Hennepin Counties we are accepting men who have the endorsement of society members but even then we are charging the higher premium of \$29.00 to cover such risks . . ."

The Aetna Insurance Company, in accordance with its group contract with the State Society, offers a rate of \$21.00 for the \$10,000 to \$30,000 indemnity limits throughout the State. This company refuses to write insurance for non-members whether in the rural districts or in the three big cities.

Incidentally, the Aetna Company has said recently: "There are some localities in Minnesota where this rate is too low but we are living up to our contract. We hope it may not be necessary to adjust the rating as it has been done in Bismarck, North Dakota, and in the western part of the same state, where the premium for an equal amount of insurance is more than \$100."

Obviously non-members underwritten by the Medical Protective Company in the cities profit by the organization and solidarity of physician members who are practicing all around them. But even they have shown themselves to be poorer risks than their brother practitioners who are members of their society. They suffer accordingly. The non-member in the country, cut off from all the loyalties and responsibilities of organization membership, is not a sufficiently good risk to be protected by either company at any price.

The advantages of good organization are further reflected in the malpractice insurance rates paid by neighboring states compared with the rates in Minnesota.

The Aetna Company offers a \$21.00 rate for all State Society members.

Following are the rates fixed by the Aetna Company in nearby States:

	\$5,000 to \$15,000 Rate		\$5,000 to \$15,000 Rate
Indiana .....	\$16.50 (Larger cities)	North Dakota .....	\$25.00 (East)
	\$20.00 (Outlying districts)		\$75.00 (Middle)
Iowa .....	\$25.00		\$150.00 (West)
Minnesota .....	\$15.50	South Dakota .....	\$30.00
		Wisconsin .....	\$25.00

The same principles apply to insurance for the medical profession as apply, for example, to automobile insurance. In the latter case, however, the rates for liability and theft are much lower in the rural districts than in the city.

Underwriters check up without bias or sentiment on the physician's reliability and upon his standing with his fellows. They are interested, solely, in the amount of money the physicians may some day cost their companies. Obviously, good organization such as characterizes the State Society in Minnesota, has an actual cash value which is passed on, in the regular course of events, to the physician purchaser of protection in Minnesota.



## OF GENERAL INTEREST

Dr. R. L. Lacey of Bemidji was recently chosen superintendent of the Lake Julia Sanatorium Board of Directors and will take charge January 1, 1933.

Dr. Frank F. Wildebush, graduate of the University of Minnesota, 1927, who had a fellowship in eye, ear, nose and throat work, has become associated with the Siversten Clinic, Minneapolis, in charge of the eye, ear, nose and throat department.

Dr. H. W. Christianson, formerly of the Mayo Clinic, Rochester, Minnesota, is now located at 706 Medical Arts Building, Minneapolis, limiting his practice to surgery of the anus and rectum and diagnosis of colonic, rectal and anal diseases.

Dr. L. Raymond Scherer, graduate of the University of Minnesota, 1928, who had a fellowship in medicine and also post graduate work in Philadelphia, has become associated with the Sivertsen Clinic, Minneapolis, in charge of the department of internal medicine.

Dr. W. H. Valentine of Tracy, Minnesota, was elected president of the Minnesota Sanitary Conference held in Saint Paul the latter part of October. Other officers are Dr. L. M. Roberts, Little Falls, vice president, and Dr. A. J. Chesley of the State Board of Control, who was re-elected secretary-treasurer.

Dr. L. C. Culligan of Saint Paul has been admitted to a fellowship in the American College of Surgeons. Dr. Culligan is a graduate of the University of Minnesota, 1922, and completed a fellowship in The Mayo Clinic, Rochester, Minnesota, in 1926. He is a member of the surgical staff at the United States Veterans Hospital at Fort Snelling.

At its meeting in October, the Board of Directors of the American Society for the Control of Cancer took the following action:

It was voted that the *Bulletin* of the Society be made its official organ and that the present relationship between the Society and the *American Journal of Cancer* be discontinued.

Three new buildings—the Henry M. Hurd Memorial Hall, the Osler Medical Clinic and the Halsted Surgical Clinic—have been recently added to the Johns Hopkins Hospital and were dedicated on October 28, 1932, with appropriate ceremonies. The cost of the new buildings totals nearly \$2,000,000, and an endowment for maintenance of \$3,000,000 by an unnamed benefactor added to the interest in the dedicatory proceedings.

Dr. J. M. T. Finney, professor of surgery, in addressing the audience, recalled that it was Dr. William S. Halsted who "introduced the use of rubber gloves, one of the greatest single contributions to the operating room technic ever made." Dr. Finney added: "Just here enters a touch of hospital romance. The use of rubber gloves in the operating room was first suggested in order to protect the hands of the then operating room nurse, the future Mrs. Halsted."

Dr. William S. Thayer made the dedicatory address at the opening of the Osler Medical Clinic.

The Henry M. Hurd Memorial Hall costing \$150,000

was made possible by a gift from the late George K. McGaw, a trustee, accompanied by a \$35,000 endowment fund. Dr. Hurd had been superintendent of the Johns Hopkins Hospital from 1889 to 1911, in addition to being professor of psychiatry.

## MINNESOTA STATE BOARD OF MEDICAL EXAMINERS

MINNEAPOLIS NATUROPATH PLEADS GUILTY TO PRACTICING HEALING

State of Minnesota vs. P. O. Olson

P. O. Olson, forty-seven years of age, 4021 Elliot Avenue South, Minneapolis, Minnesota, entered a plea of guilty to an information charging him with practicing healing without a Basic Science Certificate before the Honorable Harold Baker, Judge of the District Court, Willmar, Minnesota, on October 3, 1932.

Olson, who claims to have received a degree of Doctor of Naturopathy for the sum of three hundred dollars after attending school for one year in Minneapolis, has been making frequent trips from his home in Minneapolis to Willmar, Minnesota, and that vicinity. In 1931 he was ordered by the County Attorney of Kandiyohi County, Mr. Charles A. Swenson, to desist from practicing healing without a license. Subsequently, Olson has been making trips in the vicinity of Harrison. He was arrested following an investigation made by the State Board of Medical Examiners in May, at which time he admitted that he had been in Harrison for the last two weeks in April and had averaged sixty dollars per week in cash from his treatment of patients. Olson also refers to himself as a "magnetic healer."

Judge Baker sentenced the defendant to a term of ninety days in the county jail of Kandiyohi County. This sentence was suspended upon the following conditions: (1) that Olson pay Kandiyohi County's costs of the proceedings amounting to \$32.20; (2) that the defendant absolutely refrain from practicing healing in any manner whatsoever in the State of Minnesota. Judge Baker instructed the defendant that he was to absolutely refrain from practicing healing in any form in the State of Minnesota until and unless he was properly licensed. The Court also informed the defendant that if it was brought to the attention of the Court that he practiced in the future, the Court would order a bench warrant issued for his arrest. In previous prosecutions before Judge Baker the Court has demonstrated that he means exactly what he says and Olson undoubtedly was impressed by the warning he received from the Court. Olson informed the Court that he was not a citizen and was anticipating going back to Sweden.

SELF-STYLED "DRUGGIST" FOUND NOT GUILTY OF PRACTICING HEALING

State of Minnesota vs. A. L. Collen

On October 11, 1932, a jury in the Court of the Honorable Karl Finkelnburg returned a verdict of not guilty in the case of State vs. Collen. The defendant, forty-six years of age, was tried on an information charging him with practicing healing without a Basic Science Certificate.

The State claimed that the defendant had rendered treatment to Mrs. Kirsten Jacobson of Dennison, Minnesota, following an automobile accident at Dakota, Minnesota, on July 15, 1932. In that accident Mrs. Jacobson sustained a Colles' fracture and a fractured patella in addition to other cuts and bruises. When the defendant was asked for his bill he made a charge of \$15.50 which later was settled for \$7.50. Collen operates a store in the Village of Dakota in front of which there is a sign reading "Drugs and Wholesale Chemicals."

On cross examination the defendant admitted that

he was not licensed as a pharmacist in the State of Minnesota, nor was he registered under the Basic Science Law. He claimed to have certain credentials in the State of Illinois under the Pharmacy Laws, but these were not produced at the trial.

The case was tried for the State by F. Manley Brist, who was appointed a special assistant County Attorney of Winona County by the Court for this trial, and Mr. E. D. Libera, County Attorney of Winona County. The defendant was represented by M. J. Owen of Winona. The Board has been advised that a splendid spirit of cooperation was shown by Mr. Libera in the prosecution of this case. This is the first time in sixteen cases in Court in 1932, involving violations of the Medical Practice Act and the Basic Science Law, that a verdict of not guilty has been returned.

## OBITUARY

### John Llewellyn Eliot

1853-1932

Dr. Llewellyn Eliot, eighty years old, for fifty years a practicing physician in Washington, and known throughout the east as an authority on smallpox, died Monday at St. Mary's hospital in Minneapolis.

Son of Dr. Johnson Eliot, Civil war surgeon, he was born in Washington and lived there the major part of his life. During his years of practice he had become acquainted with some of the leading political figures of the nation during the last half century or more. He was attached to the District of Columbia health department, division of smallpox, was in charge of the smallpox hospital there, and was consultant on the disease all along the east coast.

In 1926 with his wife he moved to Minneapolis, after retiring from practice, in order to be near his daughter, Mrs. F. E. Harrington, wife of the Minneapolis health commissioner. Mrs. Harrington, another daughter, Mrs. John C. Hanway of Greenville, Miss., and his wife survive him.

### Leroy A. Brown

1855-1932

Dr. Leroy A. Brown, seventy-seven years old, former Saint Paul police surgeon, died November 22, 1932, in Ancker hospital, Saint Paul, after a three months' illness. He had been a resident of Saint Paul forty-six years.

Born in Michigan, where he was graduated from the medical school of the state university, he came to Saint Paul in 1886 to enter practice. Not long afterward he moved to Heron Lake, Minn., where he remained for about a year, moving back to Saint Paul in 1888 to resume his practice there.

In 1915 Dr. Brown was appointed to the staff of police surgeons. On his retirement in March, 1928, he estimated that in his thirteen years of service he had answered approximately 15,000 emergency ambulance calls.

Following his retirement, Dr. Brown engaged in private practice with offices in his home. He is survived by two daughters, Mrs. Ralph E. Brewer and Miss Lucia Brown of St. Paul, and a son, John R. Brown of Kalkaska, Mich.

### PROFESSOR PUCKNER AND THE COUNCIL ON PHARMACY AND CHEMISTRY

The death of Prof. William A. Puckner on October 1, after more than twenty-six years of service as Secretary of the Council on Pharmacy and Chemistry, marked an epoch in the work of that body. In February, 1905, the Board of Trustees adopted a resolution creating the Council, and Professor Puckner took office

as Secretary on March 1, 1906. It is interesting to realize that three of the members of the Council at its inception—namely, Drs. George H. Simons, Torald Sollmann and Robert Hatcher—are still members of that body and that they with Professor Puckner were a vital force in its activities during its first quarter century. The Council has aided in the elimination of secrecy in medical prescription; it has discouraged misleading statements; it has standardized new preparations before their inclusion in the Pharmacopoeia, and it has brought the medical profession of this country to a better realization of scientific therapeutics than obtains anywhere else in the world. In its work the Council has had the approval of the majority of the medical profession, if not their constant cooperation. In 1909, shortly after taking over his duties as Secretary of the Council, the vision of Professor Puckner became so impaired that it was necessary for him to give up laboratory work entirely. Nevertheless, his memory was so remarkable, his grasp of affairs so embracing, and the force of his character so tenacious that he carried on his work efficiently almost to the day of his death. As Secretary of the Council he exercised a rare judicial attitude toward the problems that came before him, at the same time evidencing a scientific point of view in his evaluation of both laboratory and clinical evidence. The Board of Trustees will, at its next meeting, select a successor to the man who served as field marshal in the campaign for scientific therapy during the last twenty-five years. His position brought on him not infrequently bitter attacks and even the enmity of some of the commercial interests that considered themselves damaged by the Council's work. The next epoch in the career of the Council should have the cooperation from practicing physicians so complete as to indicate to manufacturers in the field of pharmacy the necessity for maintaining scientific standards if they wish medical support. (Jour. A. M. A., October 15, 1932, p. 1354.)

## REPORTS AND ANNOUNCEMENTS OF SOCIETIES

### MEDICAL BROADCAST FOR THE MONTH

The Minnesota State Medical Association Morning Health Service.

The Minnesota State Medical Association broadcasts weekly at 1:15 o'clock every Wednesday Morning over Station WCCO, Minneapolis and Saint Paul (810 kilocycles or 370.2 meters).

*Speaker:* William A. O'Brien, M.D., Associate Professor of Pathology and Preventive Medicine, Medical School, University of Minnesota.

The program for the month of December will be as follows:

- December 7—Congenital Heart Disease.
- December 14—Control of Tuberculosis.
- December 21—X-ray in Medicine.
- December 28—Periodic Health Examination.

### MINNESOTA RADIOLOGICAL SOCIETY

The Minnesota Radiological Society held its twelfth meeting at St. Luke's Hospital, Duluth, Minnesota. The following program was presented:

1. Roentgen Findings in Pneumoconiosis—Dr. J. R. McNutt, Duluth.
2. Roentgen Therapy in Carcinoma of the Uterine Corpus—Dr. F. B. Exner, Minneapolis.
3. Roentgen Visualization of the Urethra, Normal and Pathological—Dr. M. H. Nicholson, Duluth.
4. Atelectasis of the Lungs—Dr. F. Hirschboeck, Duluth.

5. Round Table Discussion on Problems of Roentgen Diagnosis and Therapy—Conducted by Dr. Gage Clement, Duluth.

## ADDRESS

## Diaphragmatic Hernia

- A. Roentgen Aspect—Dr. B. R. Kirklin, Rochester.  
B. Surgical Aspect—Dr. S. Harrington, Rochester.

## LYON-LINCOLN COUNTY SOCIETY

A. Olson of Hendricks was elected President of the Lyon-Lincoln County Medical Society, October 25. Other officers are L. J. Happe, Marshall, Vice President; H. M. Workman, Tracy, Secretary-Treasurer; A. L. Vadheim, Tyler, Delegate, and B. C. Ford, Marshall Alternate. Dr. Ford was elected Censor for a three year term.

## REDWOOD-BROWN COUNTY SOCIETY

Seventeen members of the Redwood-Brown County Medical Society held a joint meeting with the staff of Union Hospital at Union Hospital in New Ulm, November 1.

Charles N. Spratt, Minneapolis, talked on "Eye Operations," showing three reels of films to illustrate. Similar meetings are planned monthly during the winter season.

## WASHINGTON COUNTY SOCIETY

The Washington County Medical Society held its regular monthly meeting at Stillwater, November 8, 1932. Chas. N. Spratt, Minneapolis, exhibited several reels on "Surgery of the Eye."

## WEST CENTRAL MEDICAL SOCIETY

The annual meeting of the West Central Medical Society was held at Morris, Minnesota, in the Merchants Hotel, October 12, 1932. The following officers were elected: President, Dr. A. F. Giesen, Starbucy; vice president, Dr. B. Karn, Ortonville; secretary-treasurer, Dr. A. L. Lindberg, Wheaton. The State delegate is Dr. C. I. Oliver, Graceville; the alternate, Dr. C. Bolsta, Ortonville.

A banquet was served at 7 P. M. followed by the scientific program.

## MEETING OF COUNCIL WITH UPPER MISSISSIPPI AND STEARNS-BENTON SOCIETIES

A highly successful innovation in county medical society meetings was jointly staged, Saturday, October 22, by the Upper Mississippi and the Stearns-Benton Medical Societies at Little Falls.

The meeting was made the occasion for the regular session of the Council of the State Association which convened at 4 P. M. and Council members were called upon to provide the entire evening's program which followed a dinner at the Buckman Hotel.

More than eighty physicians, many of them from St. Paul, Minneapolis and Duluth and other distant parts of the state, attended the meeting, which has set a precedent to be followed often, according to state officials, in future Council and county society meetings.

The date for the 80th Annual State Meeting was definitely set by the Council for May 22 to 24. The meeting will take place at Rochester. Plans are already under way, Council members were told, to make it the most important meeting ever held in Minnesota.

A thoroughgoing discussion of malpractice insurance rates and their relation to medical organization and medical society dues occupied an important section of the time. Comparisons with rates paid by other neighboring states were made to show the favorable rates offered to members of the Minnesota State Society.

The Council also passed a resolution disapproving of the specific project of a commercial organization known

as the Minnesota Mutual Health Bureau to supply medical care, except hospital costs, at the rate of \$1.50 per month per family or individual. At the same time the Council took occasion to condemn all such proposals as against the best interests of both the public and the profession of medicine.

The dinner speaker for the occasion was F. J. Savage, St. Paul, Councilor for the Fifth District, who talked on the subject "Your Fifteen Dollars." Other speakers included M. S. Henderson, Rochester, State President, on "Fractures of the Ankle"; W. A. Coventry, Duluth, Councilor of the Ninth District, on "Office Gynecology in the Treatment of Leukorrhea"; J. M. Hayes, Minneapolis, Councilor, Sixth District, on "Cysts of the Neck," and H. Z. Giffin, Rochester, Councilor First District, on "The Data and Special Tests Necessary to a Differential Diagnosis of Various Blood Dyscrasias."

The text of the resolution on the Minnesota Health Bureau follows:

BE IT RESOLVED by the Council of the Minnesota State Medical Association that, inasmuch as there is at the present time a movement on foot whereby a contract may be issued by the Minnesota Mutual Health Bureau to any family or individual for the sum of one dollar and fifty cents (\$1.50) per month; said contract to cover medical, surgical, and dental expense, except hospital costs and X-ray work (X-ray work to be furnished at a 25% discount); and inasmuch as any physician who contracts with said Health Bureau agrees to do so for the sum of sixty cents (\$.60) per month for each family or individual and any dentist who agrees to perform dental services agrees to do so for the sum of forty cents (\$.40) per month, and further, that the balance of the one dollar and fifty cents (\$1.50) or fifty cents (\$.50) per month presumably passes into the hands of the Minnesota Mutual Health Bureau to cover its costs and profits;

BE IT RESOLVED that such procedure is against the best interests of both the public and the profession of medicine. That in our three largest cities adequate provision, for many years past, has been made for those needing medical attention and unable to pay ordinary fees. That the medical profession has always been willing to modify its charges for services rendered to meet the financial ability of patients to pay. That experience has shown that similar types of service have for years been rendered by certain lodges and that the public will not receive the best type of medical and surgical service by any such method. That primarily this scheme is advanced for the profit of its promoter at the expense of the public and physicians.

BE IT THEREFORE RESOLVED by the Council of the Minnesota State Medical Association assembled at Little Falls, Minnesota, this 22nd day of October, 1932, that we condemn any such proposal on the ground that such a plan is not in conformity with the laws of this State and would be detrimental to the public health and particularly to that group to which the plan might be offered, and in addition we would recommend to the Local Societies that the membership be advised as to the danger involved both legally and ethically of entering into any such contract, and further that a copy of this resolution be sent to the Secretaries of the Component County Societies, and published in MINNESOTA MEDICINE.

## WOMEN'S AUXILIARY

*Minnesota State Medical Association*

President—Mrs. Edward Schons, Saint Paul  
Chairman Press and Publicity—Mrs. Glen R. Matchan,  
Minneapolis  
Editor—Mrs. Horatio B. Sweetser, Jr., Minneapolis

## MRS. WALTER JACKSON FREEMAN

Mrs. Walter Jackson Freeman, president of the Woman's Auxiliary to the American Medical Association, after three weeks of illness, died in Philadelphia, October 27, 1932.

The daughter of a physician, the wife of a physician, the mother of two physicians, the life and interests of Mrs. Freeman were peculiarly closely allied to the medical profession. Her father was the late Dr. William Williams Keen of Philadelphia.

The Woman's Auxiliary to the American Medical Association has lost an inspiring and able leader, the medical profession an understanding and devoted friend.

## COMMITTEE ON STATE HEALTH RELATIONS

At the request of the Council of the State Medical Association, your Committee publishes the following information regarding expenses of patients sent to the University (Minnesota General) Hospital. Dr. H. L. Dunn, the new Superintendent, is formulating certain rules to clarify some questions regarding the application of the laws; these rules are not yet ready for publication.

"... Minnesota General Hospital shall be primarily and principally designed for the care of legal residents of Minnesota who are afflicted with a malady, deformity, or ailment of a nature that can probably be remedied by hospital service and treatment and who are unable, financially, to secure such care or, in case of a minor, whose parent, guardian (etc). . . . is unable financially to secure such care." (From '21, c. 411, sec. 2.)

Whenever any such case comes to the notice of the sheriff, town clerk, health officer, public health nurse, policeman or other public officer or any physician, it shall be his duty to, and any other person may, file with the judge of probate of the county of legal residence of such person an application for treatment of such person at the Minnesota General Hospital.

Application is made in duplicate on blanks of the Minnesota General Hospital and includes statement of financial situation and physical condition of patient. Judge of probate investigates, and, if satisfied as to inability to pay, appoints a physician in the County to examine the patient. The physician reports in writing in duplicate as to history and examination, and his opinion regarding probability of remedial value of hospital treatment; the report includes also any information available to physician as to the financial situation of the patient. The physician is to receive five dollars for the examination if he is not a salaried official of the government, and, in any case, shall receive his actual and necessary expenses; the Board of County Commissioners shall provide for such payment.

When it appears that the examination ordered by the judge of probate was not made by the patient's own physician, the hospital tries further to protect the physician's interest by attempting to get a statement directly from him as to whether or not he considers the patient to be eligible for admission as a county patient.

If not yet satisfied that patient should have care at the Minnesota General Hospital, the judge may investigate farther and may reject any application found to be without sufficient merit. If application is approved by the judge of probate, he enters the finding and communicates with the Superintendent of the Minnesota General Hospital. If applicant or his legal guardian can pay part of the cost, the court may approve the application on some terms of division of the hospital charges.

If the Hospital can receive the patient, the judge certifies approval of the application to the chairman of the Board of County Commissioners. If the patient cannot

travel alone, the Board of County Commissioners appoints someone to take him and is obligated to provide payment of expenses, plus \$3.00 per day for the round trip if the companion is not an official. Also the traveling expenses of the patient and one-half the expense charged against the patient while in the hospital is also to be paid by the county of residence of the patient.

The hospital shall treat patients admitted on certificate of the judge of probate of any County at rates based on actual cost as determined by the Board of Regents of the University.

Any resident of the State, if unable to pay ordinary physician's fees and hospital charges, may be admitted upon paying same rate as charged for County patients. The Board of Regents investigates such patients and admits deserving ones whenever there is room.

We are assured that these patients have never interfered with the care of the full number of state-county patients that are permitted by law (the hospital has a right to earn up to a total of \$330,000 for the care of state-county patients).

University students and others may under certain circumstances be admitted when there is room.

The Board of Regents of the University shall file a verified report with the State Auditor, with statement of expense charged against each patient, with name of county of each patient, and statement of any sums paid by patient or by any person in his behalf. The State Auditor delivers to the treasurer his draft against the counties involved; the treasurer notifies the county auditors, and payments to the State are made from county poor funds.

Inmates of State institutions under the Board of Control may be admitted to the Minnesota General Hospital for treatment. Expenses are paid by the Board of Control at the same rate charged for county patients.

The staff of the hospital are permitted consultation privileges and also the right to accept private cases, if they are referred by physicians in the state. During the first quarter of this fiscal year this privilege amounted to 2.1 per cent in terms of patient-days or 4.5 per cent in terms of actual number of admissions.

Children under fifteen years of age can be admitted and cared for under the Eustis endowment fund. A note is required from the home doctor concerning the patient's condition and the financial status of the family.

Any further questions will be gladly answered by Dr. H. L. Dunn directly. Your committee will be glad to cooperate in straightening out any misunderstanding that might possibly occur.



## PROCEEDINGS MINNESOTA ACADEMY OF MEDICINE

Meeting of October 12, 1932

The regular monthly meeting of the Minnesota Academy of Medicine was held at the Town & Country Club on Wednesday evening, October 12, 1932. The meeting was called to order at 8 o'clock by the President, Dr. J. C. Litzenberg. There were 43 members and one visitor present.

Minutes of the May meeting were read and approved.

The scientific program of the evening was as follows:

DR. F. C. RODDA (Minneapolis) read his Inaugural Thesis entitled "Intussusception."

### DISCUSSION

DR. IRVINE MCQUARRIE (U. of M.): There is nothing whatsoever that I can add to this paper from the point of view of the pediatrician, but I want to congratulate Dr. Rodda on its composition, its inclusiveness and the judgment that is back of this from his own experience. I would simply like to emphasize the importance of those points which are particularly the pediatrician's province, *i.e.*, the after-care of the patient and the early diagnosis which, as Dr. Rodda pointed out, may be made even by the experienced mother. We at the University Hospital frequently have occasion to see patients too late as many of ours are sent in by doctors out in the country who have not had extensive experience with the condition. Dr. Rodda is now giving lectures on the subject to our students and, therefore, these patients should get into the surgeon's hands earlier when these young men get out in practice. Students ought to be taught to develop a reflex of thinking of that condition immediately when such symptoms as intermittent crying and the postural reactions described by Dr. Rodda first occur. I have wondered if a case ever occurs in which there is no pain. Probably not. I think his idea about abnormal innervation being a possible etiological factor is a very good one. I wish that we had some more definite way of determining that. For instance, I have wondered how an intussuscepted bowel would react following spina anesthesia.

DR. A. C. STRACHAUER (Minneapolis): The diagnostic import or necessity of finding a tumor in the lower right quadrant of the abdomen in establishing the diagnosis of intussusception has been overly emphasized, in my opinion. The symptoms are so definite and characteristic that the finding of the tumor is usually quite unnecessary. As a matter of fact, from my personal experience, I have not found tumors in the lower right quadrant. Intussusception in infancy is usually ileocecal in type and not infrequently ileocecolic. Under both these circumstances tumors, when found on palpation, even after the abdomen is open, are located in the upper right quadrant, lying underneath the liver.

DR. A. T. MANN (Minneapolis): I have palpated these tumors in the right side of the abdomen from intussusception at the ileocecal valve. They lie rather closer to the midline than the normal position of the cecum and ascending colon. The reason for this is the pull on the mesentery of the entering ileum as it is drawn into the cecum and ascending colon as the intussusception progresses. The root of the mesentery is fixed at the back of the peritoneal cavity somewhere nearer the midline. It is a natural sequence that the mass, when felt, should be somewhat nearer the midline.

In regard to the question of pain as a symptom, I believe that any one of the usual symptoms of intussusception can be absent in special cases, though not all

the symptoms can be absent. I recall the report of one case in which pain was stated to have been absent.

DR. OWEN H. WANGENSTEEN (U. of M.): In America a personal experience of 80 cases of intussusception is almost unrivaled. In Australia, England or Denmark, where intussusception occurs far more commonly, 80 cases in one man's experience is not unusual.

In cases brought to the University Hospital, a not infrequent cause in delay is found to be subsidence of vomiting after its initial occurrence. I have been told by several physicians that they were dissuaded from their initial suspicion of the existence of intussusception because of cessation of vomiting, and often despite the continuance of other symptoms, as intermittent pain, blood and mucus in the stool and a palpable tumor. In his very informative paper on intussusception of eleven years ago, the late Dr. Amos Abbott, a keen observer whose experience in the surgery of children was considerable, directed attention to this confusing factor. He states that 100 per cent of his infants with intussusception vomited initially but that in 81 per cent vomiting was not resumed until after the second day. The cause of this abatement in vomiting is somewhat obscure. In looking over a number of records of patients with bowel obstruction, I have been amazed to see how many patients with obstruction of the sigmoid flexure never vomit despite enormous distension. The distension in such instances is almost invariably limited to the colon, due to the proximal competent ileocolic sphincter. Undoubtedly the regurgitation factor is an important one in the determination of the amount and frequency of vomiting in bowel obstruction. An obstruction in the small intestine is more likely to have continued vomiting, there being no competent sphincters proximally to dam back the intestinal content. In intussusception, obstruction occurs at the apex of the intussusception, not essentially a mechanical block of the lumen but as the result of edema of the invaginated gut occasioned by compression of the inner cylinder and its mesentery by the ensheathing cylinder of gut. These invaginations begin usually at the ileocecal angle, and the natural inference concerning the cause of delay in recurrence of vomiting is that the low position of the obstruction necessitates the lapse of some time to convert the initial reflex vomiting into a mechanical regurgitation.

However, if the mother's story is attentively heard and care is exercised in examining the abdomen, the rectum, and the motions of the infant, as Dr. Rodda described so well, an early diagnosis should be made almost invariably. There is one point in the differentiation of strangulation from simple types of obstruction that does not obtain in intussusception. I refer to local tenderness of the abdominal wall. Unlike other strangulation varieties of obstruction, no blood escapes into the peritoneal cavity in intussusception because the gut whose blood supply is compromised is surrounded by the normal ensheathing layer. Hence there is ordinarily no tenderness of the abdominal wall, though the parietes may be rigid during the painful spasmodic contraction of the gut.

I have seen a few cases presenting features of shock as Dr. Rodda mentioned. Last winter a female infant of 18 months with intussusception was admitted to the University Hospital with a pulse of 200. The liberal administration of parenteral fluids did not improve her as a risk. She was then transfused, being given about 300 c.c. of blood. The pulse rate dropped to 160 and its quality improved correspondingly. A compound intussusception (entero-enteric due to a Meckel's diverticulum and an ileocolic) was reduced at operation and the patient convalesced uneventfully. In the experimental laboratory, Dr. Horace Scott and I have been able to show that the blood loss factor may be significant in strangulation types of obstruction, such as intussusception in which interference with the blood sup-

ply of the bowel occurs. Ligation of the veins to a 3- or 4-foot segment of gut in a dog usually results fatally after four or five hours. The arteries being intact, under the motive force of systolic blood pressure, blood is driven into the infarcted bowel and the animal bleeds to death into his own gut. In clinical strangulation obstructions in which the constricting agent completely arrests the venous outflow, the blood loss factor is an important one, and transfusion is a remedial agent of value in its correction.

I have been bold enough to attempt conservative reduction in a few cases of intussusception. In only a few instances, however, has it been wholly successful. Usually its merit lies in this: instillation of fluid into the rectum chases the intussusceptum back, so that the surgeon has less to do at operation. In the use of a thin barium enema, the "Achilles' heel" of Hirschsprung's taxis is avoided, in that one can see whether the gut that has telescoped into the colon is completely driven back. Olsson and Pallin, of Einar Key's Clinic in Stockholm, were the first to advocate and practice the method. Barium is allowed to run into the rectum under the influence of three and a half feet of gravity pressure, no piston pressure being employed. Failure to fill the cecum fluoroscopically with barium is indication for immediate operation. The earlier the intussusception the more likely is this conservative method to succeed. I have seen no harm come from its use. Simple intussusception, as Dr. Rodda pointed out, is an affliction essentially of the first year of life and most commonly occurs between the fourth and ninth months. After this age period, compound intussusceptions (entero-enteric and ileocolic) are prone to occur and the method is not to be relied upon.

Hipsley of Sydney, who may boast the best surgical results in the treatment of intussusception (51 successive successes in cases under 36 hours' duration, *Medical Journal of Australia*, 1918), reported in 1926 acquaintance with the conservative method. Of 105 cases, he was able to reduce 62 without operation with a single death in the group. He advises its routine trial before operation. Hipsley's colleague, Clubbe, who has written an authoritative monograph on intussusception, states that he has been successful in only 10 per cent of instances with the conservative method but employs it regularly to chase the invaginated gut back before making the incision.

No matter where the intussusception presents, the incision should be made on the right side. A short incision almost invariably suffices. With one finger within the abdomen beneath the gut and by a massaging motion of the other hand on the outer surface of the abdominal wall, the intussusception is usually driven back with ease. No attempt should be made to draw the intussusception out of the abdomen until the cecum is reached. To do so necessitates a long incision and the bowel has to be pushed back into the abdomen to negotiate the splenic and hepatic flexures. As the last of the invaginated gut is pushed back, a deliberate attempt should be made to press out and evert the dimple that represents the start of the intussusception.

With early diagnosis and treatment the mortality should be very low in this variety of intestinal obstruction.

DR. J. C. LITZENBERG (Minneapolis): I would like to ask Dr. Rodda why the baby is turned over on his face.

DR. RODDA: That is the posture the child assumes during the attack of pain. After the pain has passed over, the child relaxes, assumes a normal posture and at times gets up and goes on with its play.

MR. BYRON J. OLSON (University of Minnesota Medical School), winner of the Academy's Prize Essay, by invitation read his Thesis entitled "The Role of the Eosinophil in Immune Reactions."

#### DISCUSSION

DR. W. P. LARSON (U. of M.): I think Dr. Olson's paper emphasizes the point that new and perhaps radical ideas come from the younger generation. I have been in close touch with Mr. Olson's work, and can attest to the care with which he has carried out his experiments. I have been amazed at some of the results he has obtained. The part of his work which has been of most interest to me is that which he has done with eosinophil granules.

Mr. Olson has perfected a technic of obtaining eosinophil granules in quantity from the blood of horses. This blood he has secured from the abattoir of a fox farm where a large number of horses are constantly being killed. With the granules thus obtained he has been able to produce anaphylactic reactions with various foreign proteins without previous sensitization of the experimental animal. So far as I know, this is the first work in which the anaphylactic substance has been produced in vitro, a result which I am sure will have far-reaching consequences. Mr. Olson's work seems to furnish experimental support for the view, which has been held for years by many investigators, that the eosinophil does play an active part in various anaphylactic and allergic phenomena.

In treating the various pollen extracts with eosinophil granules, Mr. Olson has likewise been able to obtain positive skin reactions to these pollens in cases which are not susceptible to hay fever or other atopic conditions.

In the short time allotted to Mr. Olson for this paper, he has only had time to present his work in an abbreviated form. I hope that in the near future it will be our good fortune to have the pleasure of reading his published papers.

DR. LITZENBERG: I think the Academy should feel very happy about awarding the essay prize to Mr. Olson and for having the privilege of hearing his fine, though necessarily sketchy, analysis of the work he has been doing. We are glad to have even a little part in such a piece of work.

DR. C. N. SPRATT (Minneapolis) reported a case of "Intracranial Aneurysms of both Vertebral Arteries." Autopsy specimen was shown.

The meeting adjourned.

R. T. LA VAKE, M.D., Secretary.

#### ACETARSONE (STOVARSOL) IN AMEBIASIS

Reports have appeared on the favorable use of the drug in amebiasis, but they are conflicting as to its therapeutic efficiency and toxicity. Experimentally it has been shown to be approximately four times as toxic as originally noted, when administered orally to rabbits and cats. Clinical cases of poisoning are not uncommon, even when therapeutic amounts of the drug are used. New and Non-official Remedies states that the physician should remember that he is working with a rather toxic arsenical preparation, which may give rise to gastro-intestinal symptoms, as well as to the same cutaneous disturbances that are found with the arspenamines, and that at the least sign of intolerance the physician should discontinue the use of the drug for the time being. There seems to be no doubt that other amebicides, arsenical and nonarsenical, are available which have equal and greater amebicidal action and are less toxic than acetarsone. (*Jour. A. M. A.*, September 3, 1932, p. 851.)

## BOOK REVIEWS

Books listed here become the property of the Ramsey and Hennepin County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of interest to physicians.

## RECEIVED FOR REVIEW

**CHILDREN'S TONSILS—IN OR OUT.** Albert D. Kaiser, M.D., Associate Professor of Pediatrics, University of Rochester Medical School, etc. 307 pages. Illus. Price, cloth, \$5.00. Philadelphia: J. B. Lippincott Company, 1932.

**CLINICAL GYNECOLOGY.** C. Jeff Miller, M.D., Professor of Gynecology, Tulane University. 560 pages. Illus. Price, \$10.00, cloth. St. Louis: C. V. Mosby Company, 1932.

**PRACTICAL OBSTETRICS.** For Students and Practitioners. P. Brooke Bland, M.D., Professor of Obstetrics, Jefferson Medical College, etc., assisted by Thaddeus L. Montgomery, M.D., Associate in Obstetrics, Jefferson Medical College, Philadelphia. 730 pages. Illus. Price, cloth, \$8.00. Philadelphia: F. A. Davis Company, 1932.

**SYNOPSIS OF GYNECOLOGY.** H. S. Crossen, M.D., F.A.C.S., Professor of Gynecology, Washington University, and Robert James Crossen, M.D., Instructor in Gynecology, Washington University. 227 pages. Illus. Price, \$2.75, cloth. St. Louis: C. V. Mosby Company, 1932.

**FERTILITY AND STERILITY IN MARRIAGE: THEIR VOLUNTARY PROMOTION AND LIMITATION.** Th. Van de Velde, M.D., formerly Director of the Gynecological Clinic at Haarlem, Holland. Translated by F. W. Stella Browne. New York: Covici Friede—Medical Books, 1932. Price \$7.50.

The same author has published "Ideal Marriage" and "Sex Hostility in Marriage," making this volume the third of a series, which are to be considered together as there are numerous cross references. Their writer intended them for general circulation, but the publishers insert a note to the effect that their sale will be limited strictly to "physicians on their written or authorized order." This is wise, for it is not many years since a Minnesota doctor served a term in prison for selling to the public a work along somewhat similar lines, and not a whit more likely than this one to arouse erotic ideas in the prurient. This is not by any means meant to impugn the author's motives. No one could give in a more delicate and inoffensive way the intimate information and advice he offers.

One of Van de Velde's postulates deserves emphasis, and that is that the subject he deals with gets too little attention from physicians, either because they consider it too indelicate, or feel that to deal with it would be lowering to the dignity of the profession. But copulation is quite as important a physiological process as is defecation or micturition, and the doctor should be as well posted on the proper handling of unsatisfactory intercourse as in the management of constipation or of incontinence. Works on general medicine

pass lightly over the subject, making a book like Van de Velde's invaluable.

Briefly stated, this thesis is that the complete sexual satisfaction of both husband and wife is a most important part of marriage—indeed that there can be no ideal marriage without it; that there are conditions outside of medical considerations that prohibit the bearing of children; that in such cases contraceptive measures are justifiable, and the bulk of the work is taken up with the discussion on the one hand of measures to overcome sterility, and on the other hand with contraception.

Much of what is said about the promotion of conception and pregnancy is general knowledge. Less well understood are Van de Velde's views on the importance of position in intercourse, the influence of the woman's orgasm, the best time to select in the menstrual cycle, and the chances of success with artificial impregnation. He dwells upon the importance of having the woman thoroughly prepared for intercourse before it is attempted, and gives precise directions about such preparation. He favors the exchange of medical certificates before marriage and considers it a mistake to abstain from intercourse for months before and after delivery, insisting, however, upon extraordinary precautions against infection and mechanical injury, with advice as to how the latter mischief may be avoided. Here are answered questions often asked and sometimes embarrassing to the conscientious physician who feels that he lacks knowledge.

Although there have been no acknowledged changes in federal or state laws prohibiting dealing in contraceptives, there is an evident change in the attitude of the public about them. Not only is the subject discussed freely in the newspapers, but of late instrument dealers have been offering openly various devices for the prevention of conception, chiefly occlusive pessaries and jellies whose only object can be the destruction of spermatozoa. A cap to fit over the cervix with instructions as to how the woman is "to get it out in the morning" leaves little to the imagination as to the purpose.

Medicine is concerned properly with the protection of patients from harm. The physician may well decline to recommend contraceptives to those who seek to avoid pregnancy for social or pecuniary reasons, but he should know at least what measures are harmful and warn his patient accordingly. Van de Velde finds no ideal preventive. To a greater or less degree all are objectionable, many positively injurious, and none sure except excision of the vasa or the tubes. For the sterilization of women he has devised an operation which it is possible to undo later, restoring fertility. This operation, which he has performed successfully both ways, he describes and illustrates.

WILLIAM DAVIS, M.D.

**HUMAN STERILIZATION: THE HISTORY OF THE STERILIZATION MOVEMENT.** J. H. Landman, Ph.D., J.D., J.S.D., of the College of the City of New York. New York: The Macmillan Company, 1932. Price \$4.00.

Between March 9, 1907, when Indiana passed the first compulsory eugenic sterilization act, and April 22, 1931, when Oklahoma made a like enactment, a total of thirty states have enrolled themselves as in favor of this kind of legislation. The federal Supreme Court has decided that the general principle of such laws is not in conflict with the Constitution of the United States, leaving the field clear for the champions of eugenics to put their theories into general practice.

Although sterilization is advocated and employed for a variety of reasons, it is on account of the eugenic motive that the laws permitting it are framed. The prime object is to prevent the transmission by inheri-

tance of feeble-mindedness, insanity and crime. Under present conditions Landman thinks the outlook is poor for making progress in this way, for he finds that of the feeble-minded only about 11 per cent come from the mating of the feeble-minded of the previous generation, "while 89 per cent come from marriages among the latent carrier group, which cannot be reached by

the light of our present knowledge." So what he thinks is needed is the establishment of an adequate scientific basis through which the 89 per cent can be reached. He asks for more science and less speculation, and until that is had he advises great caution in the employment of compulsory human sterilization.

WILLIAM DAVIS, M.D.

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